DOCUMENT RESUME

ED 045 598 40 SP 004 519

TITLE	The Application of Functional Analysis of Behavior by Teachers in a Natural School Setting. Final Report.
INSTITUTION	Washington Univ., Seattle.
SPONS AGENCY	Bureau of Education for the Handicapped (DHEW/OE), Washington, D.C.
BUREAU NO	BR-7-0376
PUB DATE	30 Nov 69
GRANT	OEG-0-8-070376-1857-032
NOTE	136p.
EDRS PRICE	EDRS Price MF-$0.75 HC-$6.90
DESCRIPTORS	*Behavior Theories, *Elementary Education, *Learning Disabilities, *Remedial Instruction, *Social Behavior, Systems Analysis

ABSTRACT

The initial purpose of this project was to demonstrate in four Washington state elementary schools the application of functional analysis of behavior to children who have learning disabilities and social behavior disturbances in the natural school setting. During the development of the project this purpose was broadened to include the prevention of academic failure as well as remediation. A selected review of continuous measurement investigations with children provided the methodological basis. The selection and training of the advisers is described, together with information on each of the schools. Because their differing needs required variations in the conduct of the project, these aspects are described separately, together with the group results and anticipated plans for each school. Results of three specific projects are listed: 1) managerial behaviors of pupils, 2) academic skills being systematically taught to individual children, and 3) academic performance of groups of pupils. The teachers' post-project impressions are discussed, as is the project administration in the Bellevue school. Conclusions were that continous measurement and contingency management techniques can be effectively employed by elementary teachers, and that by using advisors to work directly with other teachers, large numbers of students can be helped and regular classroom teachers can become skilled in behavior management. (MBM)

ED0 45598

FINAL REPORT

Project No. 7-0376
Grant No. OEG-0-8-070376-1857 (032)

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THE APPLICATION OF FUNCTIONAL ANALYSIS OF BEHAVIOR BY TEACHERS IN A NATURAL SCHOOL SETTING

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November 30, 1969

The research reported herein was performed pursuant to Grant No. OEG-0-8-070376-1857 (032) with the Bureau of Education for the Handicapped, U. S. Office of Education, Department of Health, Education, and Welfare. Contractors undertaking such projects under government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official position of the Bureau of Education for the Handicapped.

SP004519

Department of Health, Education, and Welfare

U. S. Office of Education
Bureau of Education for the Handicapped

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INTRODUCTION

Due to the uniqueness of the project, this report will be presented in seven sections rather than in the usual format. Part I states the original intent of the project and how, throughout the development of the study, a broader, more relevant purpose emerged. Part II, a selected review of continuous measurement investigations with children, provides the methodological basis for the project. The studies included in the review have a common feature beyond that of continuous measurement; target behaviors are precisely defined and data describes individuals instead of groups. Furthermore, in many of these investigations an element of the environment is changed in order to affect some pinpointed behavior. By systematically manipulating a single component experimenters are able to determine the result of their efforts.

Part III describes the selection process and characteristics of key personnel, the four advisers.* Also included in this section is a description of the four elementary schools participating. Part IV contains a description of the training program designed for the advisers.

Part V describes the operation of the project in each of the four schools. Because of the differing character and needs of each school, the strategies of the advisers are different and the conduct of the project, therefore, variously explained. The group results from the four schools and the anticipated plans for each of the project sites are also described.

Part VI presents the results of specific projects, categorized by type of project. The first category contains projects whose focus was on managerial behaviors of pupils. The second grouping contains example projects of academic skills being systematically taught to individual children. The next section contains projects measuring the academic performance of groups of pupils. The next category contains data which, although subjective, reflect the post-project impressions of most of the classroom teachers from the four project schools. The final category pertains to the administration of the project in the Bellevue, Washington school.

The final section of the report, Part VII, presents two concluding statements. First, continuous measurement and contingency management techniques can be effectively employed by elementary teachers. Second, by using advisers to work directly with other teachers, large numbers of students can be helped and regular classroom teachers can

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*The term "adviser" is used throughout this report to indicate a teacher who works directly with other teachers, assisting them to measure and modify their pupils' performance.

become skilled in behavior management. Finally, recommendations in regard to curriculum adaptation, pupil-recording, use of consequences, and other vital areas, are presented to aid in carrying out similar training projects.

PART I

PURPOSE

The initial purpose of this project, as cited in the original proposal, was "to demonstrate through thoroughly trained teachers, the application of functional analysis of behavior to children who have learning disabilities and social behavior disturbances in the natural school setting." Some of the specific objectives cited at that time were:

1. To provide training which will result in a thorough knowledge of the basic concepts necessary for carrying out a functional behavior analysis by the experimental teacher.
2. To apply the procedures of functional behavior analysis to children with learning disabilities and social behavior disturbances in the natural school setting.
3. To develop certain phases of an elementary education program using known principles of programmed instruction.
4. To develop and refine instrumentation for measurement and to provide a responsive, consequating environment in a resource room and the regular classroom.
5. To place in the hands of other teachers knowledge gained from the project and a listing of the items used by experimental teachers--timers, counters, and other elementary measurement instruments that compose a remedial kit.

Although the central purpose of the project from beginning to end remained the same--using "functional analysis" procedures in elementary schools--the manner in which this purpose was realized underwent substantial revision. One minor difference noted was the move away from operant terminology. In the original proposal and in the early part of the advisers' training, a great amount of classic operant terminology was used (such as stimulus, response, schedules, contingencies). However, it became apparent midway through the project that such terms inhibited communication, not only between the project staff and the advisers, but even more so between the advisers and their fellow teachers. For although teachers encountered such terms as "stimulus" or "contingency" in educational psychology classes, they attach little "true" educational relevance to them. By describing events and circumstances with classroom jargon, the project personnel found teachers more receptive to the use of systematic procedures. For example, the advisers would simply refer to specific instructional materials, such as a Ginn reader, rather than call such materials "stimuli." Likewise, the term "response" was replaced with precise actions--speaking, writing, running, hitting. Contingencies or schedules of reinforcement, terms used by operant conditioners to denote arranged behavioral relationships, were merely described as rules or relationships.

The original proposal was also concerned with electronic gear and automatic measurement devices, implying that to measure behavior accurately and change it most efficiently, mechanical paraphernalia were required. The project personnel quickly realized that although "responsive environments" and "computer-assisted instruction" will some day become a part of the educational scene, this hardware is not now available. Nevertheless, valid measurement can still be obtained in classrooms by teachers using very inexpensive and readily accessible recording devices. Thus, the concern for the involvement of machinery and apparatus in classrooms was greatly lessened.

A major difference from initial proposal to project completion was in the method of implementing functional analysis procedures in the schools. The original intent had been to teach one person, the adviser, to be a skilled experimental teacher. Then the adviser would conduct a demonstration class, using children with academic and managerial problems and procedures of experimental analysis. She would pinpoint the behaviors she desired to teach the children, keep daily rate measures on these behaviors, and chart them continuously, make programming and managerial decisions based on these data, and when behavioral changes in the current setting were not satisfactory, re-arrange the environmental contingencies to alter the state of the behavior. The project adviser would use materials that could be measured daily, either commercially developed or teacher-arranged programmed materials. Then, when the adviser had the resource classroom in order, other teachers in that building would come to the resource room to be trained to observe, count, and chart behavior. Classroom teachers would also be shown how to program curricular materials, how to analyze behavioral data--to compute medians, ranges, probability values--and how, on the basis of these data, to make decisions about such things as curricular revision, seating changes, or managerial alterations. They would further be instructed in the use of continuous data to communicate with other teachers, parents, and administrators.

While the advisers were being readied to return to their respective schools, certain problems appeared. For example, if the resource room was to be the location for training all teachers in the procedures of measurement and precision, how would their schedule of training be devised? And, who would conduct their classes while they were being trained? Further, who would manage the children in the resource room while the adviser taught teachers?

Other questions of expediency arose concerning the resource room. Would it not be more relevant and certainly more efficient to train teachers in their own classrooms? The classroom teacher would probably be more apt to adopt the principles of measurement if she were working with familiar materials and with her own children, rather than with materials and children of perhaps a different level.

On the basis of these considerations the concepts of the resource room and resource teacher were revised. The strategy shift that appeared midway through the first year of the adviser's training recommended that some of the instruction the teachers received would be in their own classrooms, as it was believed that the classroom teachers would more effectively generalize and use measurement techniques if they were first instructed to use them with their children in their classes. Although three of the four schools involved in this project did establish demonstration classes whose function was, in part, to train teachers, the basic instructional exercises concerned with observation and measurement took place in the teachers' own classes.

Another major difference in purpose that appeared in the second year and was quite noticeable near the project's completion was a shift in emphasis from remediation to prevention. At the beginning of the project the advisers were instructed in remediation of children's managerial and academic problems. They were prepared to change managerial behaviors by first precisely defining behaviors, then observing, counting, and plotting the rate at which these behaviors occurred. They were provided experience in specifying and measuring such behaviors as out-of-seat activity, talking without permission, and hitting others. The advisers were next instructed as to the many tactics available to control such behaviors--presentation of some negative item, withdrawal of some positive item, or attending to some incompatible behavior. The advisers were also instructed in tutoring pupils who were experiencing problems in academic areas such as reading, writing, or math. Heavy emphasis was placed, for example, on the use of the Sullivan reading series with children experiencing reading problems.

Later in the project the emphasis was extended to include the prevention of academic failure as well as remediation. While initially only obvious academic or managerial behavior problems were measured and modified, project stress began to be placed on measuring total classes in at least one academic area. Teachers who measured the performance rates of their pupils in spelling, for example, discovered information that had previously gone undetected--that for some individuals the spelling words were consistently too easy, for others too hard. The teachers learned too that some children were gradually improving, others gradually deteriorating. Thus, many pupils who were measured, but who were not in such serious difficulty that their problems were noticeable, could be assisted. If such pupils can be helped before they grossly fail, many so-called learning disabilities can be prevented.

In summary, the primary aim of the project remained the same from beginning to end. The purpose was to translate to public school settings the precise measurement techniques proven sensitive to human behavior in laboratory and clinic settings. Three identifiable changes in structure, however, occurred from the beginning to the end of the project: 1) the use of classroom talk rather than operant terminology, 2) less use of the demonstration class to instruct other teachers, and 3) increased emphasis on measurement for purposes of prevention as well as rehabilitation.

PART II

REVIEW OF THE LITERATURE

The following selected review of the literature is included in the report because it was a functional part of the literature that proved useful as a basic readings study source for the advisers. In addition, it provides a methodological framework for understanding this teacher training project. These studies were not selected to show the chronological development of experimental analysis, but rather to illustrate its development from a laboratory method to a procedure for applied settings such as the classroom.

The following review is composed of five sections: 1) basic research conducted under highly controlled laboratory conditions, 2) investigations of single subjects in a field or clinical situation, 3) reports of single subjects in a classroom setting, 4) studies with groups of children in laboratory classrooms, and 5) reports of groups of children in public school classrooms.

Basic Research

Azrin, N. H., & Lindsley, O. R. The reinforcement of cooperation between children. In S. W. Bijou and D. M. Baer (eds.), Child development: Readings in experimental analysis. New York: Appleton-Century-Crofts, 1967, 59-66.

The purpose of this study was to discover if cooperation between children could be developed, maintained, and eliminated solely by presentation or nonpresentation of a single reinforcing stimulus available to each member of a team following a cooperative response. Twenty children were formed in teams of two each. The children were seated at opposite sides of a table containing three holes and were provided a stylus. However, they were given no specific instructions. A cooperative response (both children placing a stylus in opposite holes) was rewarded by a jelly bean during the first reinforcement period of 15 minutes. Then a 15-minute extinction period was presented, followed by a second reinforcement period which lasted until a stable rate occurred for at least three minutes.

Within the first ten minutes all teams learned to cooperate in order to receive a jelly bean. The rate of response of all teams declined during the extinction period but increased again during the second reinforcement period.

Baer, D. M. Laboratory control of thumbsucking by withdrawal and re-presentation of reinforcement. In L. P. Ullmann and L. Krasner (eds.), Case studies in behavior modification. New York: Holt, Rinehart, and Winston, 1965, 285-289.

This investigation consisted of two experiments designed to attenuate the thumbsucking of three children. The first child was shown a series of cartoons. The movie was shut off each time he began to suck his thumb and turned on again when the thumb was removed. Thumbsucking decreased during contingent withdrawal and re-presentation of the movie but returned when the movie was offered on an incontingent basis.

The second experiment used two children in a yoked control. Both children were watching the film. However, the withdrawal and re-presentation contingency was applied to only one child; the movie was presented and withdrawn from the other child on an incontingent basis. Results showed that thumbsucking decreased when it was followed by withdrawal of sight or sound but did not decrease when withdrawal was random.

Barrett, B. H., & Lindsley, O. R. Deficits in acquisition of operant discrimination and differentiation shown by institutionalized retarded children. In L. P. Ullmann and L. Krasner (eds.), _Case studies in behavior modification_. New York: Holt, Rinehart, and Winston, 1965, 348-358.

This research explored the discrimination abilities of institutionalized retarded children. The subjects were shown a console containing two lights (which alternately flashed for one minute) and an attached lever below each light. Thus, there were four possible responses, i.e., to pull either lever when its corresponding light was on or to pull either lever when its corresponding light was off. However, the only response initially rewarded, by a piece of candy, was pulling the left lever when the left light was on.

The experimenter found that the children who eventually performed best learned to pull a lever when a light was on (response differentiation) before they learned to pull only the left lever when the left light was on (stimulus discrimination).

Lovitt, T. C. Free-operant preference for one of two stories. _Journal of Educational Psychology_, 1967, _58_, 84-87.

In this study seven 12-year-old children were used as subjects. The children were placed one at a time in an experimental room and told they would be listening to stories. Two stories, "White Falcon" (W) and "The Incredible Journey" (J) were presented simultaneously to each child. Pressing a hand switch 45 times per minute enabled the child to hear one story, while not pressing allowed him to hear the other. If he responded at approximately one-half the specified rate, he heard some of both stories simultaneously.

There were six segments to this experiment. During the first segment the subject received J if he pressed the switch and W if he did not press. These conditions were reversed in the second segment. During the third period only W was offered, regardless of the subject's response rate; in the fourth, only J was available. The fifth and sixth segments repeated the conditions of one and two respectively.

Results of the study showed that a record of the subjects' choices coincided with verbal statements of preference in five out of seven cases.

Single Subject in a Field or Clinic Situation

Kerr, N., Meyerson, L., & Michael, J. Procedure for shaping vocalizations in a mute child. In L. P. Ullmann and L. Krasner (eds.), *Case studies in behavior modification*. New York: Holt, Rinehart, and Winston, 1965, 366-370.

This study attempted to alter the vocalization of a three-year-old mute child through reinforcement. During Phase I the experimenter reinforced vocalizations by joggling the girl gently and singing to her after each sound she made. In Phase II the experimenter attempted to develop the child's ability to imitate sound by reinforcing only those vocalizations which replicated his own. However, the child's vocal output dropped to nearly zero, presumably because of her fear of the experimenter's voice. Therefore, Phase II was dropped and Phase III initiated. In this phase the experimenter brought the vocal output back up to its previous level by eliminating his own vocalization and proceeding as he had in Phase I. Then he gradually re-introduced his own vocalizations until he could vocalize once every 10 seconds without decreasing the child's vocal output. In Phase IV only those sounds which were imitiative were rewarded at first; next, only imitiative speech which occurred within 5 seconds of the experimenter's vocalizations was rewarded until, in the final session, a level of 60% appropriate vocal responses was attained.

Patterson, G. R. A learning theory approach to the treatment of the school phobic child. In L. P. Ullmann & L. Krasner (eds.), *Case studies in behavior modification*. New York: Holt, Rinehart, and Winston, 1965, 279-285.

This study shows the use of behavior modification techniques to cure a seven-year-old's unreasonable fear of leaving his mother. During play sessions the child was encouraged to simulate the action he feared by making the boy doll leave the mother doll. This play was reinforced with an M & M. He was also encouraged to vocalize the situation and describe the doll's "feelings" about leaving its mother. If these vocalizations reflected a positive feeling about the separation, the child was rewarded with an M & M. Later sessions required that the child not only act out separation behavior with dolls, but actually leave his mother. This behavior was consistently rewarded by both the mother and therapist. Gradually, the child was able to leave his mother for increasingly longer periods of time both during therapy sessions and at home during play periods. The child was finally able to return to school.

Williams, C. D. Elimination of tantrum behavior by extinction procedures. In L. P. Ullmann & L. Krasner (ed.), Case studies in behavior modification. New York: Holt, Rinehart, and Winston, 1965, 295-297.

The child discussed in this study had excessive tantrums at bedtime if his parents left the room before he fell asleep. This behavior was modified simply by eliminating parental attention to his tantrums. Previously, when the child began to cry, the parents had returned to the room until he slept. At the advice of the experimenter the parents no longer re-entered the room, but let the child cry. After ten trials the child no longer cried when he was put to bed. No punishment was used; the reinforcement of the parents' presence was merely removed.

A second extinction procedure had to be used later after the child's aunt reinforced the tantrums by remaining in the bedroom when the child began to cry. Only eight trials were necessary to remove the unwanted behavior the second time.

Wolf, M. M., Risley, T., & Mees, H. Application of operant conditioning procedures to the behavior problems of an autistic child. In L. P. Ullmann & L. Krasner (eds.), Case studies in behavior modification. New York: Holt, Rinehart, and Winston, 1965, 138-146.

This study is an account of the application of operant principles to the hospital treatment of a severely disturbed three-year-old boy. The child had difficulty establishing relationships with people and displayed self-distructive temper tantrums. Also, as he had recently had a cataract operation, it was important to teach him to wear his glasses.

Dickey's tantrums and bedtime problems were handled by a combination of mild punishment and extinction. Dickey was placed in his room whenever he had a tantrum, and the door was shut. Not until Dickey stopped crying was the door opened. The most difficult part of this procedure was persuading the attendants not to cuddle or hold Dickey after he had a tantrum, as this provided social reinforcement for the tantrums and made extinction procedures difficult to maintain. By the end of three months his tantrums had decreased significantly.

Teaching Dickey to wear his glasses was a more difficult procedure. It took a few trial and error periods to find a proper reinforcer. Candy and fruit did not work when used alone, so it was necessary to deprive the child of breakfast and lunch to make food a more powerful reinforcer. It was also necessary to add a roll bar to the back of the glasses to guide the ear pieces over his head and behind the ears. At first he was reinforced for merely carrying the glasses; later he had to look through the lenses to receive reinforcement. After this stage progress was rapid, and he wore his glasses continuously during meal sessions in his room. When released from the hospital, he was wearing them about tweleve hours a day.

Throwing the glasses was extinguished in the same manner as the tantrums. Verbal behavior, like glasses-wearing, was established by using food as a positive reinforcer.

Single Subjects in Public School Classrooms

Becker, W. C., Madsen, C. H., Arnold, C. R., & Thomas, D. R. Contingent use of teacher attention and praise in reducing classroom behavior problems. Journal of Special Education, 1967, 1, 287-309.

This study reports an effort to implement behavior modification principles in five different classrooms in an Illinois public school. Two children with disruptive behavior such as inappropriate talking, disturbing others, inattention, or running in the classroom, were chosen as the target subjects in each classroom.

The procedures began with a baseline period during which the rate of the problem behavior was recorded for the target children. The teachers were also rated at this time so that changes in their teaching techniques could be substantiated.

During the second phase each teacher was given general instructions to be used with her entire class: 1) make explicit rules and be consistent in the application of these rules, 2) ignore disruptive behavior, and 3) praise all behavior that is appropriate to the classroom. Another set of instructions further specified behaviors to be ignored or praised with the target subjects. In all classrooms teachers were able to implement these techniques and decrease undesirable behavior.

Evans, G. W., & Oswalt, G. L. Acceleration of academic progress through the manipulation of peer influence. Behaviour Research and Therapy, 1968, 6, 189-197.

This 13-week experiment was concerned with the effects of peer group influence on two under-achieving students in a fourth-grade spelling class. During the first four-week period baseline data were taken on weekly spelling test scores. During the second four-week phase the teacher announced daily that the class would be dismissed for recess immediately if Subject 1 could correctly spell a specified word. If he could not, the whole class remained in until the regular recess time. During the third phase early recess depended on Subject 2's response to the spelling question. The results showed that when the experimental conditions were in effect both Subject 1 and Subject 2 showed considerable improvement in test scores. When experimental conditions were discontinued Subject 2 continued to perform at this level, but Subject 1's performance declined to its previous level.

The experiment was repeated in three different classrooms. In Experiment 2 there was no decline in scores when experimental conditions were terminated. In Experiment 3, conducted in a sixth-grade social science class, the rise in correct answers was not as great as in the previous experiments. Experiment 4, also in a sixth-grade classroom, showed a decline in the scores during the experimental phase. But since the scores of the other children in the classroom also dropped, the decline may have been due to some other variable such as the approaching summer vacation. Differences in data between the fourth-grade and sixth-grade classes may have also been due to differences in the teachers' attitudes toward the sixth-grade class and toward this experiment.

Patterson, G. R. An application of conditioning techniques to the control of a hyperactive child. In L. P. Ullmann & L. Krasner (eds.), Case studies in behavior modification. New York: Holt, Rinehart, and Winston, 1965, 370-375.

This report describes a technique for controlling the behavior of a hyperactive child in a classroom situation. The child earned an M & M for each 10 seconds he remained quietly in his seat. The M & M's were not immediately granted following each interval; instead, a desk counter recorded the number earned. The other children in the classroom were encouraged to provide social reinforcement for this behavior with the promise that they would all share the M & M's the hyperactive child earned. By the end of 15 sessions the child was able to sit quietly for 20 to 30 minutes and the reinforcers were no longer needed.

Zimmerman, E. H., & Zimmerman, J. Alteration of behavior in a special classroom situation. In L. P. Ullmann & L. Krasner (eds.), Case studies in behavior modification. New York: Holt, Rinehart, and Winston, 1965, 328-330.

This article discusses 1) the control of two unproductive classroom behaviors through removal of their social consequences and 2) maintenance of desired behavior with social reinforcers.

The first child muttered or deliberately mispelled words when called upon in a spelling drill, answering correctly only after the teacher spent considerable time with him. To change this behavior a new approach was tried. The child was instructed to write a word on the board. He misspelled it ten or more times, always glancing at the teacher as he wrote. The teacher ignored him until he finally spelled it correctly, then said "Good, now we can go on to the next word." Attention was given the child only after he had emitted a correct response; other responses were ignored. After one month his inappropriate behavior had dropped to almost zero.

The second child displayed tantrums, baby talk, and crying behavior in the classroom. These behaviors were modified in the same manner. The teacher did not attend to the deviant behaviors, but when the child exhibited acceptable behavior she sat and chatted with him. After several weeks the tantrums disappeared entirely.

Groups of Children in Laboratory Classrooms

Birnbrauer, J. S., Bijou, S. W., Wolf, M. M., & Kidder, J. D. Programmed instruction in the classroom. In L. P. Ullmann & L. Krasner (eds.), *Case studies in behavior modification*. New York: Holt, Rinehart, and Winston, 1965, 358-364.

This study describes the "programmed learning classroom" at the Rainier School. The objective of the project was to find ways in which teachers could reach more retarded children without sacrificing individual attention. This was achieved through designing 1) programmed materials in primary subjects for educable retarded children, 2) programmed procedures, and 3) methods whereby motivation, cooperation, good study habits, and concentration could be established and maintained.

The programmed self-instructional material left teachers free to work with individual children. Behavior problems were handled almost exclusively through extinction, that is, by ignoring instances of disruptive behavior and reinforcing studying with verbal praise. Because the children did not work steadily for social approval alone, a token system was added. For correct answers the children were given stars which eventually could be exchanged for prizes.

The physical layout of the classroom included three individual instruction rooms at one end and an observation room at the other. Because the children worked on programmed materials, the teacher was often free to take a single child for individual work. The small instruction rooms were used for this purpose to avoid disturbing the class.

Harris, F. R., Wolf, M. M., & Baer, D. M. Effects of adult social reinforcement on child behavior. In R. Ulrich, T. Stachnik, & J. Mabry (eds.), Control of human behavior. Glenview, Illinois: Scott, Foresman, and Company, 1966, 130-138.

This paper presents five studies exploring the effects of adult attention on disruptive behaviors of nursery school children. Normal children from the University of Washington Laboratory Preschool were involved in these studies. The procedures for all studies were the same. First, the undesirable behavior was pinpointed. In one case it was excessive crawling, while in another excessive whining and crying. Two others exhibited markedly solitary play behavior, and a fifth showed a complete lack of vigorous play activity.

Next, a baseline record of the typical behavior of child and teacher was established. Since it was noted in all cases that undesirable behavior almost always attracted teacher attention, a program was instituted whereby the teacher did not attend to problem behavior, but gave immediate attention to desired behavior. If the child's behavior was significantly changed, a second procedure was instituted to verify the effects of adult attention on child behavior. This procedure involved a return to the original condition--teacher attention to undesired behavior. In all cases undesired behavior again became very frequent. During the final stage of the study, reinforcement was contingent upon the desired behavior once again until the previous level was re-attained. Post-checks were later obtained to determine the stablility of desired behaviors.

Homme, L. E., deBaca, P. C., Devine, J. V., Steinhorst, R., & Rickert, E. J. Use of Premack principle in controlling the behavior of nursery school children. In R. Ulrich, T. Stachnik, & J. Mabry (eds.), Control of human behavior. Glenview, Illinois: Scott, Foresman, and Company, 1966, 93-94.

The Premack principle states that if behavior B is more probable than behavior A, the probability of A is increased by allowing B only after A has occurred. This principle was applied in a nursery classroom. First a preliminary investigation analyzed the children's behaviors and divided them into high and low probability activities. The high probability activities included running, screaming, and working jigsaw puzzles. The low probability activities included listening in class, sitting quietly, and watching the blackboard. High probability behaviors were then made contingent on performing some low probability behavior. For example, a period of sitting quietly (low probability behavior) was rewarded by allowing the children to run and scream (high probability behavior). In a later stage the subjects earned tokens for low probability behaviors. These could be used to purchase participation in high probability behaviors. Within a few days control in the classroom was virtually perfect.

Nolen, P. A., Kunzelmann, H. P., & Haring, N. G. Behavioral modification in a junior high learning disabilities classroom. Exceptional Children, 1967, 34, 163-168.

This study, conducted in the Experimental Education Unit, University of Washington, included eight children in a junior high classroom. These children had been admitted to the Unit on the basis of serious learning and behavior disorders. Individual programs were arranged for each child in the classroom. Activities with known high-interest value were placed in an area of the classroom and used to reinforce academic activities. All children except one made significant academic gains over approximately three months.

Groups of Children in Public School Classrooms

Bushell, D., Wrobel, P. A., & Michaels, M. L. Applying "group" contingencies to the classroom study behavior of preschool children. Journal of Applied Behavior Analysis, 1968, 1, 55-63.

This study attempted to analyze the use of positive reinforcement in a classroom situation. Twelve preschool children enrolled in a summer school were the subjects for the study. The class day was divided into three sections. During the first 20 minutes individual activities were made available to the children. The next 25 minutes were devoted to Spanish instruction and the last 30 minutes to "study teams" in which the children were paired so that a more skilled child served as instructor for a less skilled child. During each of these sections the children were given plastic tokens when they seemed to be studying. These tokens were used to "purchase" a special surprise event such as a movie or trip to the zoo which was planned for every afternoon. To avoid unproductive talking, the tokens were never mentioned to the children and never given when requested. The giving of tokens was often accompanied by a verbal statements such as "good" or "you are working well." If a child did not earn enough tokens he remained behind in the classroom with a teacher while the other children went to the "special event."

This study was divided into three stages. During the first stage the special event tickets had to be purchased with the tokens. During the second stage tokens were given for the same behavior, but they no longer had purchasing power. Every child received a special event ticket when he arrived at school, regardless of his behavior. During the final stages, the original conditions were restored and the tokens regained their purchasing power.

The results indicated that when a special event was contingent upon studying, study behavior was high. When the special event was "free," study behavior fell.

Clark, M., Lachowiez, J., & Wolf, M. M. A pilot basic education program of school drop-outs incorporating a token reinforcement system. *Behaviour Research and Therapy*, 1968, *6*, 183-189.

Ten girls, ages 16 to 21 and employees of the Neighborhood Youth Corps (NYC), participated in this study. All the girls were high school dropouts and depended upon NYC wages as their sole means of support. At the beginning of the study, all the subjects were given the Junior High Level California Achievement Test (CAT). From the scores of this test each girl was matched with another who scored similarly so that there were two groups of five girls. One of these groups was designated as a *job group* and received a basic education program with token reinforcement.

The classroom group received close to the regular 32-hour week's salary but the money was paid in two ways: 1) as wages for 3 hours of regular work each afternoon and 2) as reinforcement for academic behavior during a 3 1/2 hour classroom session in the morning. In the classroom the girls earned points for correct answers to instructional material, each point being worth 2 cents toward the regular NYC $1.25 per hour. Any money earned over $1.25 per hour was considered a bonus and could be used to buy commodities at a local store.

Each student could choose from a selection of pre-determined instructional material. By shifting the distribution of points the experimenters attempted to induce the girls to choose areas in which they needed training.

After two months both groups of students were re-tested on the CAT. The results revealed that those in the classroom group made far greater increases in scores than the subjects in the job group and that the token system was effective in altering students' choices.

Hall, R., Lund, D., & Jackson, D. Effects of teacher attention on study behavior. *Journal of Applied Behavior Analysis*, 1968, *1*, 1-12.

This study was an attempt to analyze experimentally the reliability with which teachers could improve the study behavior of poverty area students by contingent attention. The same procedures were used for all six students in the study.

In the first baseline stage an outside observer recorded the amount of non-study behavior for each student and the amount of teacher attention directed toward each student. During the second stage, or reinforcement stage, the observer held up a small square of colored paper, unnoticed by the pupil, to cue the teacher when the child was exhibiting desired study behavior. The teacher attended to the child only when she received this cue. When a stable rate of studying had been achieved a control period was initiated in which the teacher returned to her former pattern of attending to non-study. The rate of studying fell as a result of this reversal.

Finally, the teacher returned to the procedure of attending to and rewarding only positive behavior. When high study rates were once again observed the teacher continued to reinforce the desired study behavior without cuing signals from the experimenters. During the remainder of the year, periodic post-checks were made to determine whether the new levels of studying were being maintained.

McKenzie, H. S., Clark, M., Wolf, M. M., Kothera, R., & Benson, C. Behavior modification of children with learning disabilities using grades as tokens and allowances as back-up reinforcers. Exceptional Children, 1968, 34, 745-753.

This study attempted to determine whether a token reinforcement system consisting of payment for grades could increase academic behavior of children in special education classes. Another aim was to reduce the managerial problems associated with implementing token systems. By using grades as tokens the teacher was involving subjects in a familiar practice; and the use of allowances as back-up reinforcers included the parents in the program.

As in previously discussed reports, this study began with a baseline period in which the normal behavior of the classroom was observed. Five contingencies were in effect throughout this period: 1) recess was earned by successful completion of all assignments, 2) free time was earned by children who finished their academic work before the end of the period, 3) leaders and monitors were chosen on the basis of improvement in academic work, 4) eating lunch in the cafeteria with the rest of the group was allowed to all who finished specified work before lunch; children who did not finish remained in the classroom, and 5) attention from the teacher was contingent upon appropriate behavior.

During the next stage the amount of allowance received by the child was determined by his weekly grades. The parents of each child determined the amount of money the child was paid, but each child earned more for an A than a B, and more for a B than a C. A grade of D or F earned a minus amount so that the child was indebted. Debts had to paid through household chores.

During this period the amount of study behavior increased significantly with highly distractible and disruptive children. This behavior was maintained for the remainder of the year even after the children were returned to normal classrooms.

O'Leary, K. D., & Becker, W. C. Behavior modification of an adjustment class: A token reinforcement program. Exceptional Children, 1967, 33, 635-645.

This study dealt with the use of token reinforcement in an effort to eliminate the disruptive behavior of eleven nine-year-olds who were considered emotionally disturbed. Other methods of reinforcement had been tried with these children and had failed. One purpose of the project was to devise a token reinforcement program which could be used by one teacher in an average classroom. A second purpose was to determine whether, by transferring control to teacher attention, the token system could be gradually withdrawn without an increase in disruptive behavior.

The procedures were divided into three stages. First, during the baseline stage observers obtained data which reflected the frequency of deviant pupil behavior under usual conditions. Second, a reinforcement period was instituted during which tokens were given on a 1 to 10 rating scale five times per day. This rating scale measured the extent to which the children followed instructions. Points earned could be exchanged for a variety of small prizes at the end of the day.

In the third stage, as appropriate behavior increased an effort was made to fade out the token system and replace it with teacher approval. This was done by decreasing the number of ratings per day from 5 to 3, and increasing the number of points required to obtain a prize. Also, the points were accumulated for two, three, and finally four days before they could be exchanged for prizes. Positive group behavior was also reinforced to encourage social reinforcement for appropriate behavior. The results showed that the amount of deviant behavior was very low by the end of one month.

Lovitt, T. C., Guppy, T. E., & Blattner, J. E. The use of a free-time contingency with fourth-graders to increase spelling accuracy. Behaviour Research and Therapy, 1969, 7, 151-156.

An investigation conducted in a fourth-grade class of 32 pupils assessed spelling performances of the group as a function of three conditions--1) when traditional procedures were in effect, 2) when contingent free-time was individually arranged, and 3) when a group contingency, listening to the radio, was added to the individually obtained free-time. As a result of these procedures, the majority of the pupils' spelling performance increased, indicating that the use of contingent free-time and radio-listening were effective reinforcers.

Haring, N. G., & Hauck, M. A. The use of free-time contingent on reading behavior in a team teaching classroom. Unpublished manuscript, University of Washington, 1969.

A program conducted at Bellewood Elementary School in the Bellevue School District used contingent extra recess and physical education activities to stimulate reading performance in a basal series. Twenty-four students from grades 4-6 were involved. Sessions lasted for 30 minutes, a portion for silent reading and comprehension questions. In addition, pupil-teachers selected from the reading class listened to each student read orally a passage from his book and recorded number of errors and time required. After the session the children determined their correct and error rates and plotted the data on a graph displayed on the wall. The free-time activities were offered when a student's performance remained the same or improved from the day before.

Haring, N. G., & Hauck, M. A. Improved learning conditions in the establishment of reading skills with disabled readers. Exceptional Children, 1969, 35, 341-352.

Learning conditions were individually programmed in a group setting to provide sequential arrangement of reading material and systematic presentation of reinforcing events to optimize each child's performance. Arrangements of reinforcing events were designed first to accelerate performance rate, then to maintain the high rate. When learning conditions were individually appropriate, each child averaged between 100 and 200 more correct responses every day and spent little time avoiding reading. The students not only made more correct responses daily and worked longer, but they also progressed in instructional reading levels from one and one-half to four years over five months of instruction.

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Part III

PERSONNEL SELECTIONS AND SETTING

In spring of 1967 four school districts were selected for this project: Seattle, Lake Washington, Clover Park, and Bellevue. After the grant application was funded, several meetings were held with administrators from these districts to present the rationale of the project. It was explained to these administrators that the first year of the project would be involved in training the advisers, who would return to the school districts the second year. It was also explained that the advisers' salaries would be paid by grant monies from the United States Office of Education during the initial two years and by the districts after that time. It was further agreed with the school districts that after termination of the project they would continue to use the adviser as a supportive person to classroom teachers.

As to the selection of the advisers, few restrictions were imposed by the University of Washington. One requirement was that each applicant be acceptable to the graduate school of the University of Washington. A second stipulation was that this person have previous experience as an elementary school teacher. A third requisite was that this person be committed to the project for at least three years.

Each of the four elementary schools is described below.

Sherwood Forest Elementary School

Sherwood Forest is an elementary school in Bellevue, Washington, an upper middle class suburb east of Seattle. The total population of Sherwood Forest is Caucasian. In the academic year 1968-69, Sherwood Forest had an enrollment of 644 children and a teaching staff of 20. Of this staff, one was a first-year teacher and the rest had from one to thirty years experience. Six of the Sherwood Forest teachers had general certificates and eight had standard certificates. Six of the teachers had a sixth year of training and one had a master's degree.

Mr. Lloyd Magruder is the principal of Sherwood Forest School. He has been in education for twenty years and principal of Sherwood Forest School for seven years.

The project teacher or adviser at Sherwood Forest Elementary School is Miss Betty Casperson. She holds a B.A. degree and a standard certificate and is currently working on her master's degree at the University of Washington. Miss Casperson has taught for ten years, grades two through six.

Graham Hill Elementary School

Graham Hill Elementary School is in the Seattle District. During the past five years Graham Hill's enrollment has varied from 400 to 450 students. Of this total, 65 percent are Caucasian, 15 percent Negro, 10 percent Chinese, and 10 percent Japanese. Economic levels vary from low to upper middle class.

The faculty at Graham Hill consists of seventeen teachers. During the past year four were beginning teachers, seven had from one to five years experience, two had from five to ten years experience, and four teachers had over ten years experience. All the teachers have completed their university training and are certified by the State of Washington. Eight of the teachers have master's degrees or the equivalent in college credits.

The principal at Graham Hill School, Frank Ross, has served as the building administrator for the past seven years. Prior to this assignment, he served as a high school teacher, a vice-principal, and a principal.

The project teacher or adviser at Graham Hill School is Tal Guppy. Prior to assuming his role as project adviser, Mr. Guppy served two years as a teacher at the intermediate level. He holds a B.A. degree and a standard certificate. Currently, Mr. Guppy is working on his master's degree at the University of Washington.

Audubon Elementary School

The Audubon Elementary School is in the Lake Washington School District, located in the Redmond-Kirkland area in suburban Seattle. Audubon Elementary School serves predominantly middle and upper middle-class families. The community around Audubon is growing at about 25 percent per year. The attendance at the beginning of the 1968-69 year was 519 students; by year's end the enrollment had reached 640. Audubon contains 23 teaching stations, including four classrooms housed in portables. The staff there the past year was basically a young one. Fifteen of the 23 teachers had from one to five years experience. One teacher had fifteen years experience, while the rest had from six to ten years of experience. Two teachers had master's degrees, eight had standard general teaching certificates, and the others had provisional teaching certificates.

Mr. Don Hultgren, the principal, was a teacher for six years before assuming the responsibilities of a principalship, which he held for one year prior to the beginning of the project. Mr. Hultgren holds a B.A. in education, and an M.A. in educational administration.

Mr. Ralph Bohannon, the project teacher has a B.A. in education and an M.Ed. in special education. Mr. Bohannon taught at both the high school and junior high school levels for eleven years prior to his involvement in the training project.

Park Lodge Elementary School

Park Lodge is an elementary school in the Clover Park School District. Clover Park is located in Lakewood, a suburb of Tacoma, Washington. The area comprises both high-income residential areas and low-income rental areas. It is situated close to two large military complexes--Fort Lewis Army Base and McChord Air Force Base. Park Lodge Elementary School has an enrollment of approximately 425 students. Many of the students come from military families and have attended several schools throughout the country and abroad. The population of Park Lodge is not stable; as high as 60 percent turnover from year to year is common. With the varied backgrounds of the students at Park Lodge, the staff is faced with problems that many of the other schools in the Clover Park District do not have.

There are 16 teachers on the staff at Park Lodge. All of the teachers have at least five years of college preparation, and three have master's degrees in education. In addition to the regular staff members, Park Lodge is provided part-time service by a remedial reading teacher, an elementary counselor, a speech therapist, a school psychologist, a music teacher, and a school nurse. The experience level of the Park Lodge staff is quite varied. Some of the staff members have as few as two years experience while others have over twenty.

The principal of the Park Lodge Elementary School, Mr. George Sutich, has over twenty-four years of experience in education. He has both teaching and administrative experience at all educational levels in the Clover Park District and has a master's degree in education.

The project adviser at Park Lodge, Mr. Hal Caufield, has a varied background in education. He has served as a classroom teacher, an elementary school counselor, and a resource teacher. Mr. Caufield has a B.A. in education and a master's degree in special education, and is completing work on administrative credentials at the University of Washington. Mr. Caufield has begun work on a doctorate in the fall of 1969.

Part IV

TRAINING

The first year of the project emphasized training of the advisers. The explanation of this training sequence, which was conducted at the Experimental Education Unit of the University of Washington, is presented by academic quarters.

Fall Quarter

The activities of the first quarter comprised two types of events--training activities and a series of seminars.

Six training steps were scheduled for the project advisers: 1) orientation, 2) observation, 3) assessment, 4) target specification, 5) modification, and 6) communication. The first training exercise consisted of background readings on the methods of behavior management. Several readings were assigned, along with lists of study questions. A glossary containing most of the common terms in the field of behavior modification was also discussed with the advisers. The second training step consisted of three observation sessions at the Experimental Education Unit.

The third training activity required that the advisers perform a series of academic assessments. Following these assessments, the advisers listed the items or events pertinent to the evaluation (materials, instructions, subsequent events) and recorded pupil performance in terms of the number of items answered correctly per unit of time. Each of the project teachers performed three academic assessments: 1) evaluation of a student from a classroom at the Experimental Education Unit; 2) assistance to a fellowship student preparing to conduct an evaluation; and 3) evaluation of a child referred from the Division of Child Health. Following this latter assessment, each project teacher presented the data at a Division of Child Health Case Conference.

Following the academic assessment of a student from an Experimental Education Unit classroom, each teacher selected one of the child's behaviors. The project teachers were required to observe, record, and chart the rate at which this target behavior occurred. They wrote a brief description of 1) the relevant events present during the observation, 2) their justification for selecting the target behavior, and 3) the criterion for terminating their observations.

The fifth training step required the advisers to remediate behavior problems. Each adviser was assigned at least one student from a class at the Experimental Education Unit and another student from his school district. The advisers then designed and implemented curricular or procedural techniques to alter these target behaviors.

The sixth training phase included several steps designed to facilitate the adviser's return to his district school. First, at a scheduled teachers' meeting at his assigned school, each adviser described the purpose of the demonstration project and the functions he would perform as a result of his training. Following this description each adviser scheduled regular visits with the teachers in his school to assay their situations. Third, teachers from the schools of the four districts visited the Experimental Education Unit facilities to obtain an explanation of the rationale of direct recording and continuous measurement. Finally, two meetings were held involving all relevant school district and Experimental Education Unit personnel. At this time the purpose of the project was re-affirmed and plans were begun for maximum involvement of the advisers.

Two sets of seminars were conducted throughout the first quarter--one where the advisers presented data relevant to their activities and one where invited lecturers spoke on various educational topics. These seminars were attended not only by the four advisers, but by graduate students in special education from the University of Washington, and special education teachers from the Experimental Education Unit and Seattle area schools. During the data-sharing seminars each participant was assigned a time to present his topic, analyze the results, offer concluding remarks, and answer questions.

The other seminar series was conducted by invited guests, generally staff members from the University of Washington. The purpose of these gatherings was to acquaint the students with a wide variety of professionals involved with child development. Speakers were selected from education, psychology, medicine, psychiatry, and sociology.

Winter Quarter

The major effort of the winter quarter was to provide the advisers more experience at their schools; fewer requirements were scheduled at the Experimental Education Unit. In order to realize this objective, two assignments were provided each adviser. The first was to assist at least three classroom teachers to develop management procedures for individual children. Assistance was provided to classroom teachers for such academic behaviors as reading, spelling, and mathematics, and for such managerial annoyances as talking out of turn or fighting on the playground. In each of these instances the adviser first consulted with the classroom teacher to determine the general nature of the problem, then conducted a series of observations to assess the extent of the problem, and finally recommended to the teacher some procedural or curricular technique whereby a behavior change might be made. The adviser also demonstrated to the classroom teacher how to administer rehabilitation procedures and measure the child's behavior under these new conditions. Following this rehabilitation attempt, the classroom teacher and the adviser studied their data to determine whether or not a change in behavior had resulted. If the data indicated that a favorable change was taking place, the procedure was continued and the measurement duties were left with the classroom teacher. If the procedures proved less than satisfactory, further alterations were designed.

The second assignment for the trainees was to assist a regular or special classroom teacher to obtain evaluations from an entire class in at least one academic area. They aided the classroom teacher in designing procedures and curriculum materials whereby daily assessments could be obtained in such areas as reading, spelling, and mathematics. The trainees further instructed the classroom teacher to establish some individualized contingency system that allowed each child to earn, for example, points or minutes of free time upon his successful completion of an academic requirement.

Throughout the winter quarter both the guest lecture series and the data seminar sessions continued. Now, however, the advisers were required to conduct the meetings. Each adviser had several opportunities to organize the meeting, monitor questions about the projects, and summarize each presentation. They were further encouraged to begin similar seminars in their respective district schools. In attendance at these latter meetings were the teachers being assisted by the advisers, the principals, and other interested teachers. The purpose of these meetings was to explain further the procedures of continuous measurement and data analysis to as many elementary school teachers as possible.

In addition to these meetings the four advisers met weekly at the Experimental Education Unit to present the results of their efforts at each school. In addition, the four advisers discussed common strategic problems involved in implementing such a project in the public schools.

Spring Quarter

During spring quarter the advisers were involved almost entirely at their respective schools. The only regular contacts they had now at the Experimental Education Unit were the seminar meetings and the weekly meeting of the advisers. These latter gatherings were particularly helpful in that many of the procedures for implementing classroom evaluations presented by one member were accepted, modified, and used by others.

Two basic strategies were selected for the third quarter of the demonstration project. The first was an attempt to encourage more and more classroom teachers to obtain daily measurements and to use the information obtained from these data for evaluation purposes. The second was to assist administrators and elementary school principals to evaluate and assess teachers on the basis of pupil performance data.

Teachers obtaining daily measurements from children were assisted by the advisers to evaluate this information. When curricular or procedural alterations were attempted in efforts to affect pupil performance, teachers were encouraged to analyze their data in order to determine the result of such efforts.

Likewise, principals were encouraged to evaluate teachers on the basis of child performance records. In certain instances, principals played a vital role in encouraging teachers to provide them with data evaluations. And in describing their programs to other administrators, some principals defended the project on the basis of the number of teachers who had been assisted to measure objectively, the number of children on whom daily measures were obtained, and the number of successful remediations.

Summer Quarter

During the summer quarter a workshop was held for the advisers, 30 special education teachers from the Seattle area, the principals of the four project schools, and other educators and administrators from the Greater Seattle Area. There were three main sub-programs involved in the workshop: 1) five demonstration classrooms involving the project teachers and other workshop participants, 2) a discussion series for the principals and administrators, and 3) a guest lecture series attended by all members of the workshop.

The Workshop in Instructional Improvement: Behavior Modification was held from June 17 to July 17, 1968. Each adviser from the project conducted a demonstration classroom with five to seven participants assigned to each classroom. Each participant conducted an individual project designed to develop skills required for behavior specification, recording, and graphing, and the application of contingency management principles in the classroom.

The workshop program for principals and administrators met for 12 days, from June 18 to July 3, 1968. The principals and administrators were involved in three main activities: 1) a series of discussions on such topics as observation techniques, graphing and data display, contingency management, and programming, 2) a project relevant to their particular school, and 3) a project with children using contingency management and programming principles.

Part V

OPERATION

Because the facilities, capabilities, and needs of the four school districts involved in the project were diverse, four individual plans were devised cooperatively by the project staff and participating school districts. The following is a description of how each of the four school districts implemented the demonstration project. Also included in this section are the group results from each school and plans of the four districts for continuation of the project.

Park Lodge School, Clover Park District

Involvement in the demonstration project began at Park Lodge in spring of 1968. The program was introduced to the staff by the principal, Mr. George Sutich. The project adviser, Mr. Caufield, addressed a faculty meeting concerning the purposes of the project and the services that would be provided.

Although staff involvement during the spring of 1968 was not mandatory, there was no difficulty in getting teachers involved in the project. Teachers were asked to make referrals to the adviser, who would then work with them to remediate pupil problems. Most of the initial referrals pertained to managerial problems, the majority of which were handled in the regular classroom. The adviser observed the child, assisted the teacher to record the number of infractions, and counseled the teacher in designing and implementing a remediation tactic. Periodic follow-up visits were arranged.

In addition, the adviser organized several groups of pupils with academic deficits in demonstration classes. These classes served a twofold purpose. First, the procedures of continuous measurement and assessment could be demonstrated with groups of children; and second, service could be provided to several academically retarded children. The facilities housing these demonstration classes included observation space, thus facilitating teacher-training exercises. The demonstration classrooms proved effective for getting staff members involved in the project; for once the teachers had observed the individualized procedure and understood the techniques used to obtain continuous measurement, they could employ them in their own classrooms.

At the end of the 1967-68 school year six teachers were involved in measurement projects at Park Lodge. Meanwhile some 225 children were being charted daily.

In fall of 1968 individual referrals continued to come to the adviser while several demonstration remedial classes were again established.

Teacher-training continued throughout the second year as staff members began to use techniques and procedures observed in the demonstration classes. In addition, the counselor, psychologist, and remedial reading teacher assigned to Park Lodge began to use "behavior modification" techniques in their contacts with children. By the end of the 1969 school year 12 of the 16 staff members were involved in some measurement project, and service was being provided to 405 students.

The results of the demonstration project at Park Lodge are illustrated by Figures 1 and 2. Figure 1 indicates the average number of teachers using measurement each week throughout the second project year. Figure 2 reveals the average number of children charted each week.

During the 1969 year the Clover Park District plans to continue their commitment at Park Lodge and involve other schools as well. Beginning in fall of 1969, four classroom teachers from the district will be selected to receive the same type of training that Mr. Caufield experienced prior to his assignment at Park Lodge. The only difference will be that while Mr. Caufield received his training at the Experimental Education Unit at the University of Washington, the four new people will be trained at the Park Lodge Elementary School. Mr. Caufield will serve as the project trainer. Following an extensive training period, these four people will assume adviser roles. Thus four additional schools in the Clover Park District will receive the kind of service provided Park Lodge during the previous year. This new project will be under the joint sponsorship of the Clover Park School District and the Experimental Education Unit and financed by an EPDA grant, which agrees to pay a portion of the trainees' expenses if the districts are willing to assume future continuation of the project.

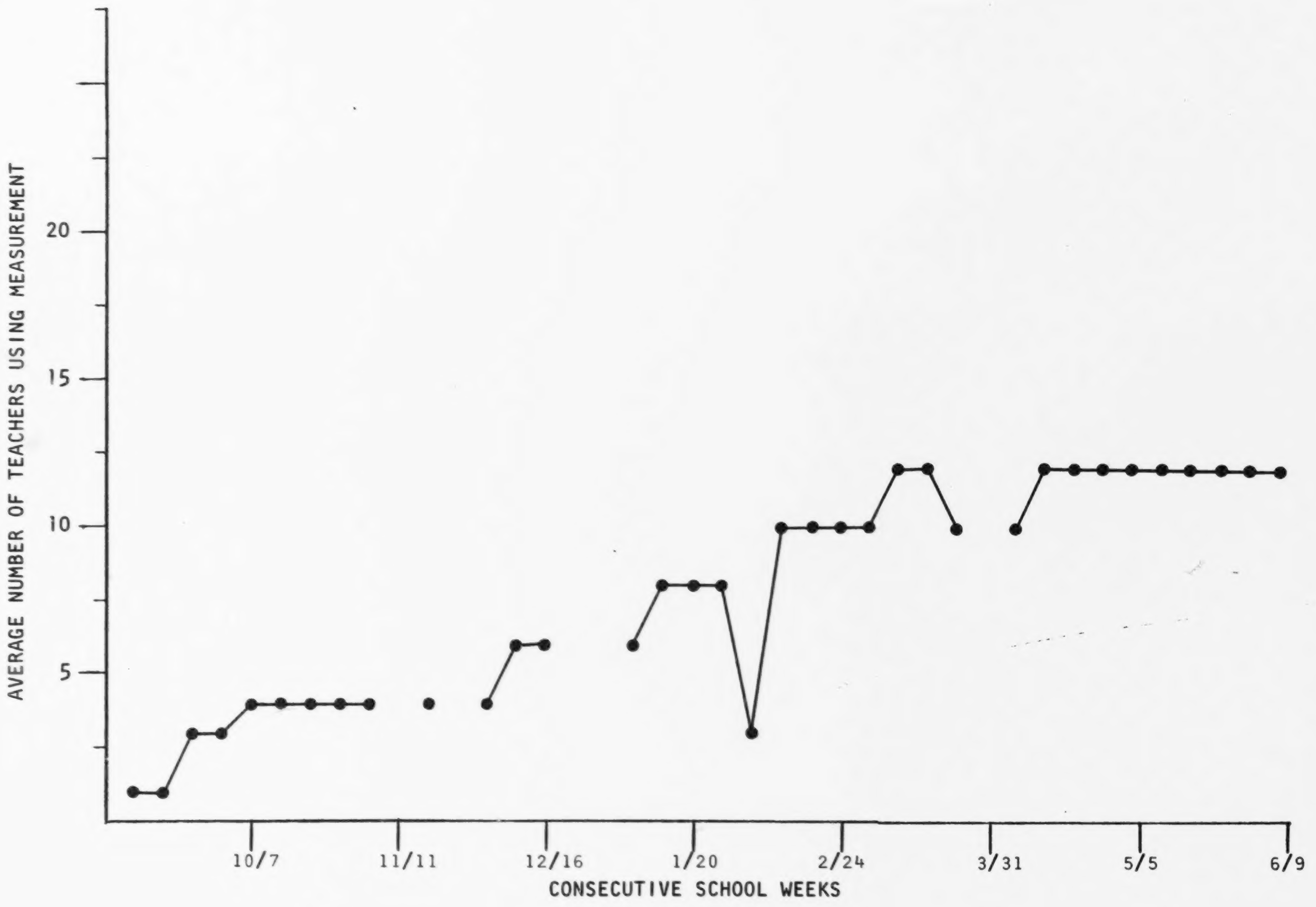

Figure 1. Average number of teachers using measurement at Park Lodge during the 1968-69 school year.

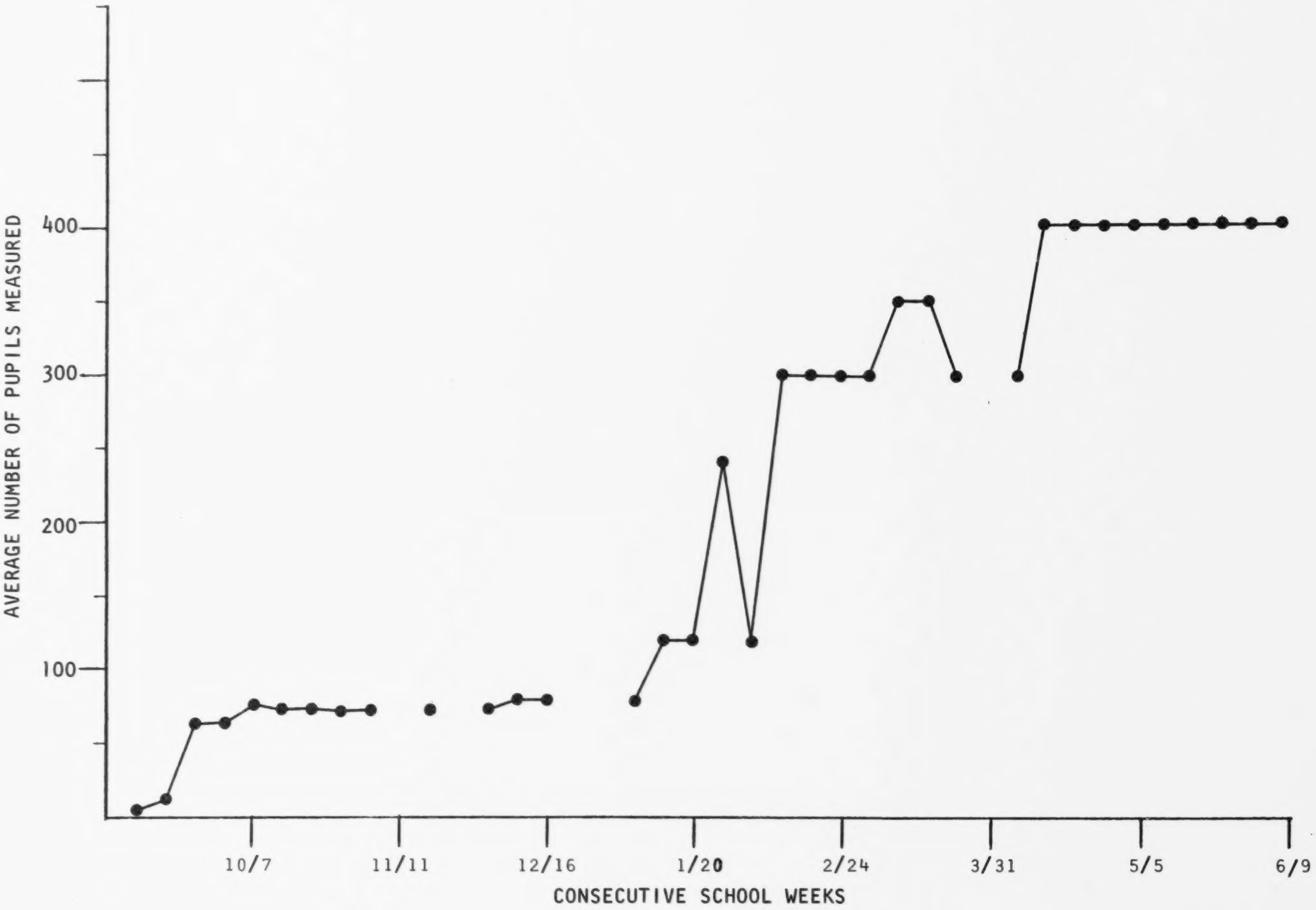

Figure 2. Average number of pupils measured at Park Lodge during the 1968-69 school year.

Audubon School, Lake Washington District

In spring of 1968 Mr. Hultgren, the principal of Audubon School, was contacted concerning a plan to assign a teacher adviser to his building. Mr. Hultgren expressed interest and was subsequently invited to several orientation sessions at the University of Washington. At these meetings the project representative of the University discussed with the school administration the types of services the advisers would in time be able to furnish. The project rationale was presented to the Audubon staff at a faculty meeting and approved.

At Audubon teachers were encouraged to seek the adviser's help but could participate in the project to whatever extent they chose. Consequently when help was sought motivation was high. No children were taken from their classrooms for special assistance, since all remediation was conducted in their classrooms.

Involvement began with one teacher in spring of 1968, but by the end of the year five teachers had taken part in some form of contingency management. The following fall, work was begun with a teacher who expressed interest in developing an individualized reading program for her entire class. As the year progressed, some teachers entered the training sequence as others either continued or completed what training they felt necessary or relevant. By the year's end 18 of the 23 teachers had attempted measurement projects; several had continued throughout the entire year. Those who began early in the year had developed considerable proficiency and independence and only occasionally sought the adviser's counsel.

In spring of 1969, the project adviser was asked to conduct in-service training sessions for 16 of the district and special education teachers who operate on a resource room basis, assisting children both directly in special settings and indirectly through regular classroom teachers. These weekly in-service sessions were concerned with children referred by regular teachers throughout the district. They concentrated on the common problems of assessing deficits and designing remediation procedures for children, and communicating and transferring these skills to regular teachers.

The results of the work at Audubon School are reflected in Figures 3 and 4. Figure 3 illustrates the number of teachers assisted weekly; Figure 4, the average number of pupils charted per week.

Dr. Empy, the district superintendent, met with the project adviser during spring of 1969 asking the adviser to explain the program and its results, and to make recommendations for the continuation of the project. The district decided that the demonstration project had had a sufficiently impressive effect and that continued district support was warranted. Dr. Empy then met with the project adviser, the director of elementary education, and the principal of the Special Education Center to determine how to best use the services of the project adviser in the future. Two alternate strategies were considered: 1) the project adviser could serve those teachers, psychologists, counselors, and principals working with the more severe problem children in the district, or 2) the project adviser could be used as a teacher-trainer, working with the special education teachers as a liason between special and regular education and training special education teachers to serve, eventually, as classroom advisers. It was Dr. Empy's opinion that the latter approach was the more valuable as it allowed for a wider coverage of measurement procedures. Consequently, the project adviser was assigned to an elementary school as an administrative assistant and to special education as a consultant to train teachers throughout the district. The project adviser will assume the responsibility for developing the in-service training for all special education teachers. He will work each Friday afternoon with the entire group of special teachers and individually with them in their own classrooms.

Looking beyond the 1969-70 school year in Lake Washington, it is possible that several precision teaching classrooms will be established to handle problems too severe to be managed in the regular classroom. It is also anticipated that consulting service will be extended into the secondary schools of the district.

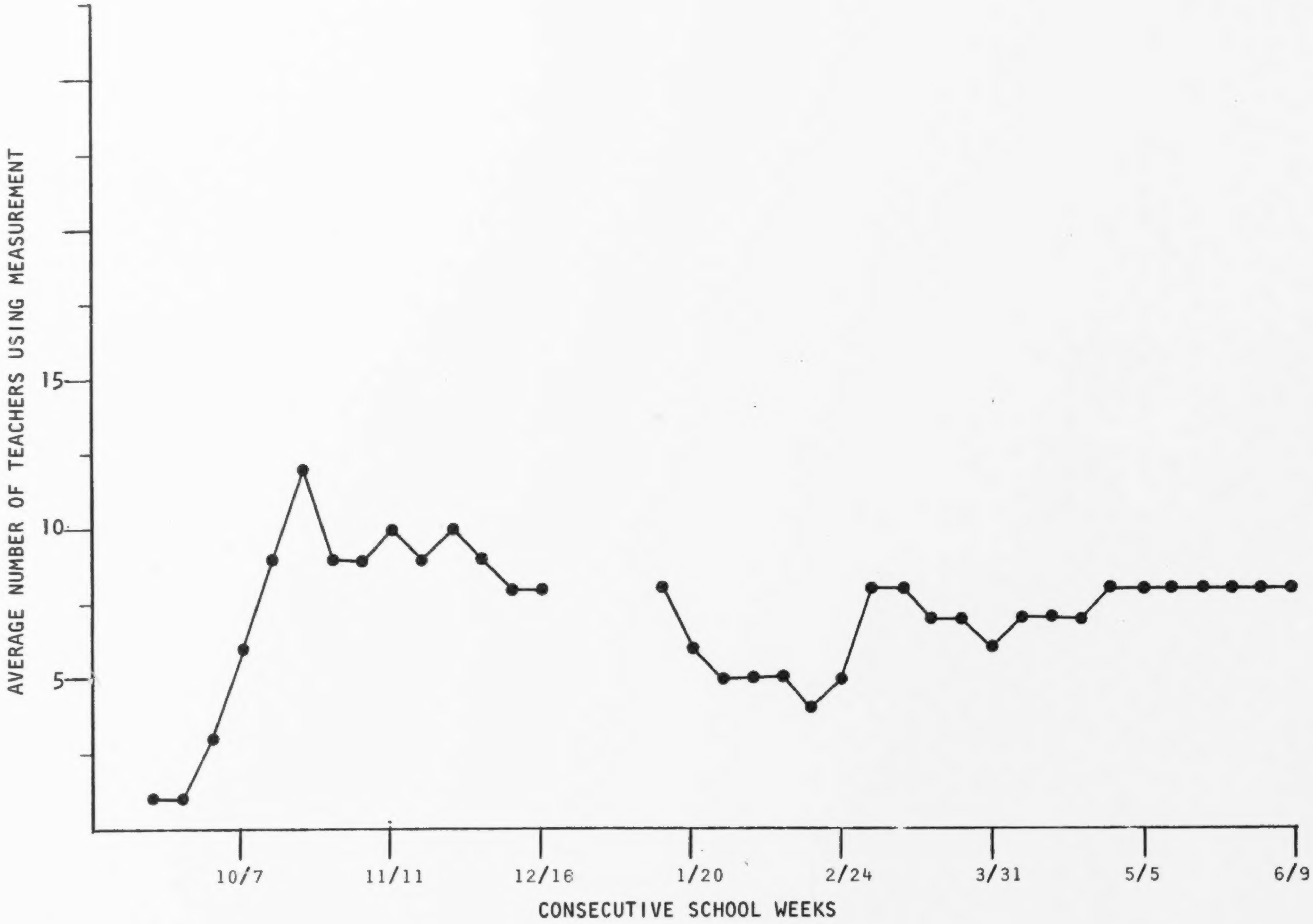

Figure 3. Average number of teachers using measurement at Audubon during the 1968-69 school year.

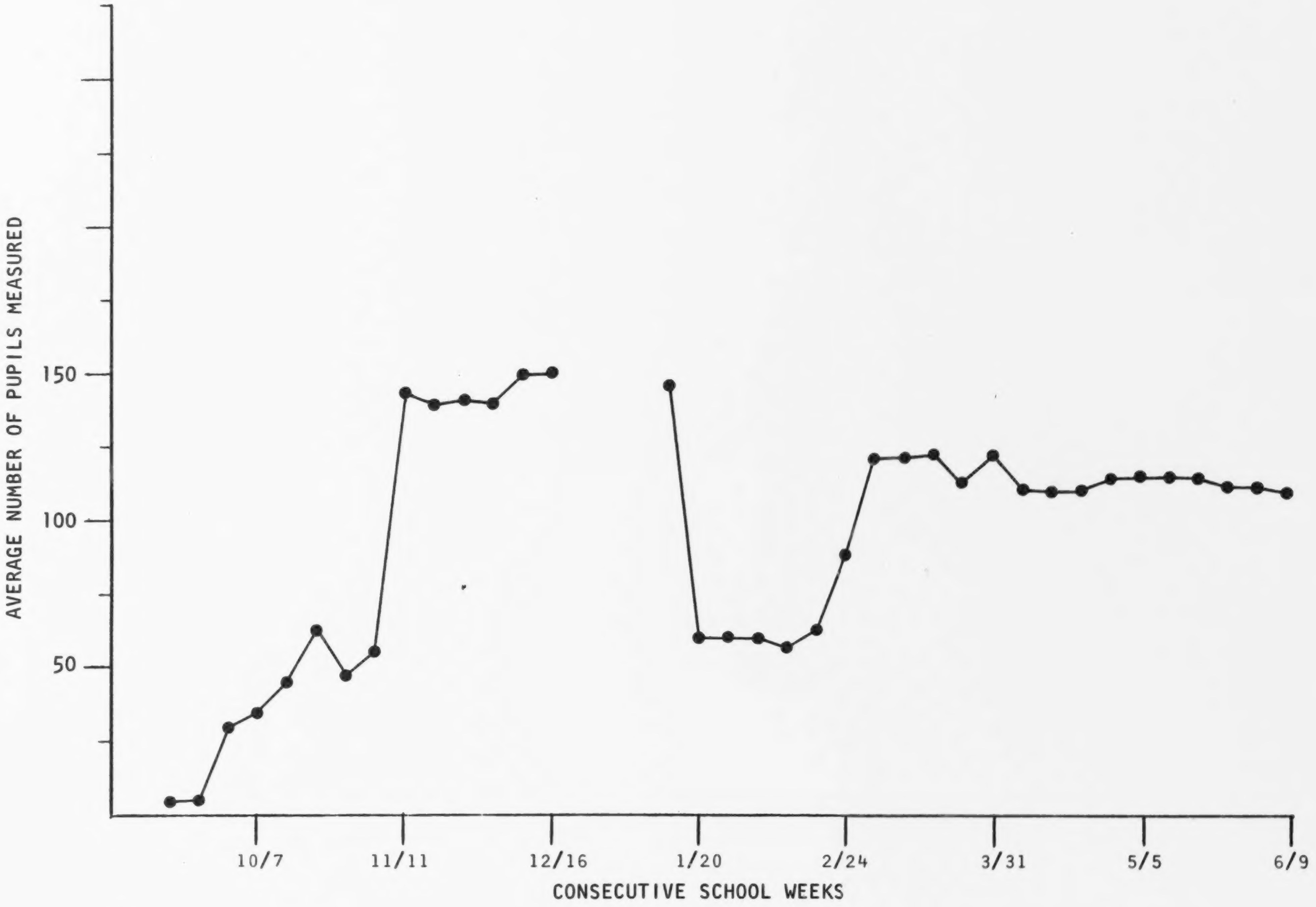

Figure 4. Average number of pupils measured at Audubon during the 1968-69 school year.

Graham Hill School, Seattle District

This program began in winter of 1968 after the adviser had been given one quarter of intensive training at the Experimental Education Unit. No formal in-service program was begun for the teachers; instead, the adviser provided services only to those teachers requesting them. By the end of the school year, the adviser had assisted eight teachers to establish and maintain modification projects for approximately 80 children, mostly in the areas of reading and spelling.

The following year Graham Hill began a systematic teacher-training program. Several sequential assignments were given each teacher. First, they observed two children in the demonstration classroom, wrote out continuous narratives of the students' activities, and discussed these narratives with the adviser. Second, each teacher was required to pinpoint and record for a number of days one pupil's social behavior. The teacher was then visited by the adviser or principal and, if the extent of the observed behavior merited a change, possible manipulation tactics were discussed. If an environmental change was made, the teacher and adviser evaluated its effectiveness.

Third, after successfully modifying a social behavior, teachers were requested to identify and alter an academic behavior with the same pupil used for the social modification. Feedback procedures were similar to those used in the social modification. As the fourth step, teachers were required to alter a second academic behavior on a different student. Finally, each teacher was required to measure his entire class in one academic area. The same modification and communication procedures employed during the previous training steps were maintained.

By the end of the school year five teachers had completed the entire training program, while the remainder of the faculty had progressed to various positions in the program. At the end of the year, 16 teachers were involved with one or more children in an academically-oriented project. Five teachers were managing one or more group projects in their classrooms. Eight involved Sullivan reading, three SRA reading, four spelling, five math, one handwriting, and one theme-writing.

To complement the in-service training program, a number of teachers' meetings were held to discuss measurement procedures and interpretation. In addition, two data-sharing meetings were conducted by Dr. Eric Haughton of the University of Oregon at which teachers presented and discussed projects completed in their rooms.

Two demonstration classrooms were established at Graham Hill. It was the goal of these classes to demonstrate how Sullivan reading materials might be used in a rehabilitation setting. The classes were intended to provide specific training activities for the teachers and, in addition, provide service to children deficient in reading achievement. Both of the classes were managed by the adviser. One class was composed of 11 fourth and fifth grade students; the other was made up of second and third grade children. All children were selected because of a deficiency in reading. The classes began in September and continued through November, at which time the pupils were sent back to their regular classrooms. Procedures used in the demonstration setting--individualized programs, pupil correcting, pupil graphing, pupil evaluating--were continued in the regular classrooms.

Figures 5 and 6 indicate the effects of the project at Graham Hill. Figure 5 presents the number of teachers being served by the adviser from September to June. Figure 6 shows how many pupils were charted each week throughout the year.

To provide for continuation of the project at Graham Hill, a committee of five teachers, the adviser, and the principal wrote a research proposal entitled "Precision Methods for Continuous Progress." This proposal was submitted to the Seattle School District in spring of 1969 and subsequently funded. The allocated funds will allow Graham Hill to employ an adviser, conduct a teacher-training workshop, and purchase some curricular materials. Several goals were set forth in this proposal. One was to have all students in the school receive individualized instruction in language arts and mathematics by the end of the 1969-70 school year with continuous data provided in both areas.

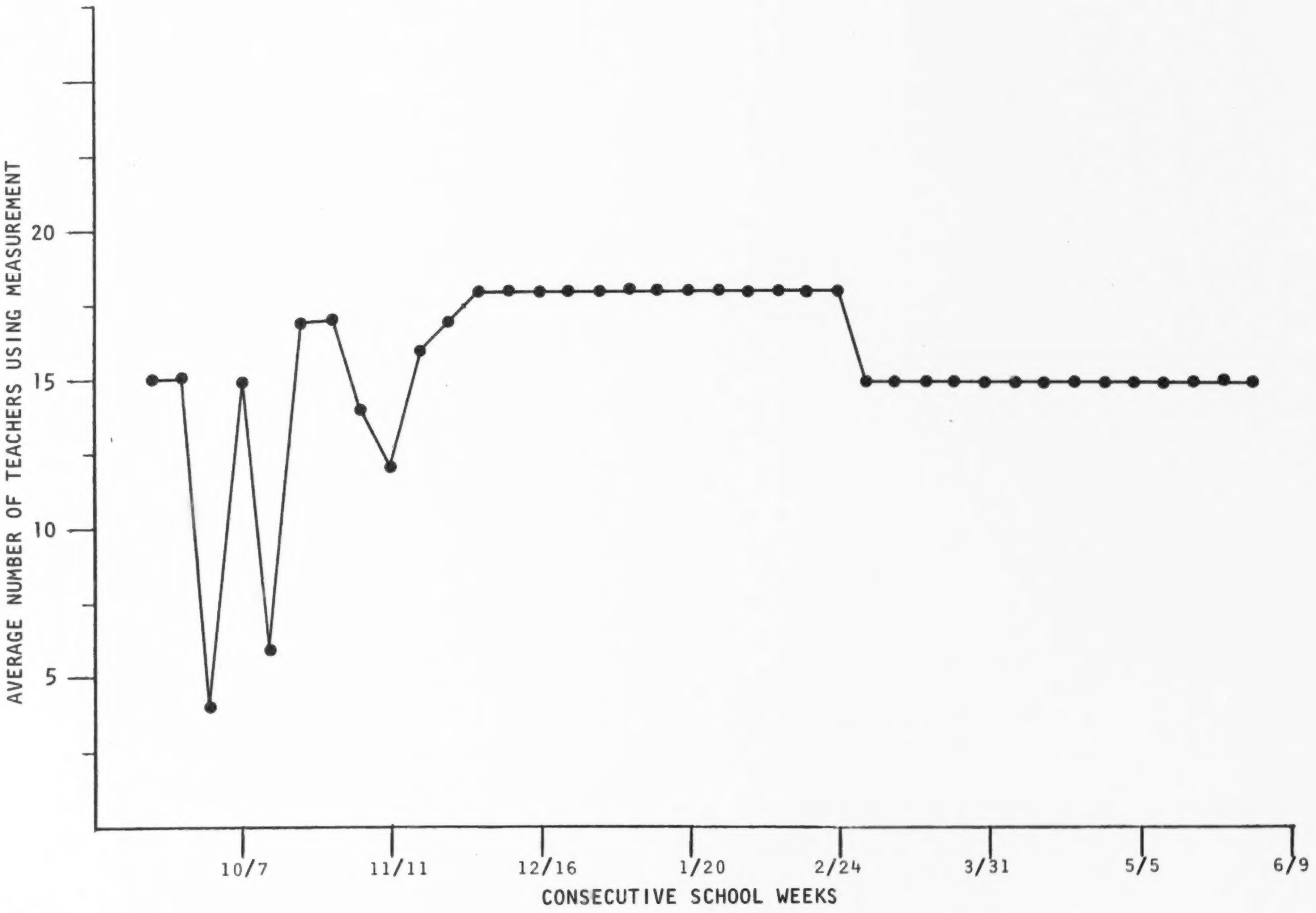

Figure 5. Average number of teachers using measurement at Graham Hill during the 1968-69 school year.

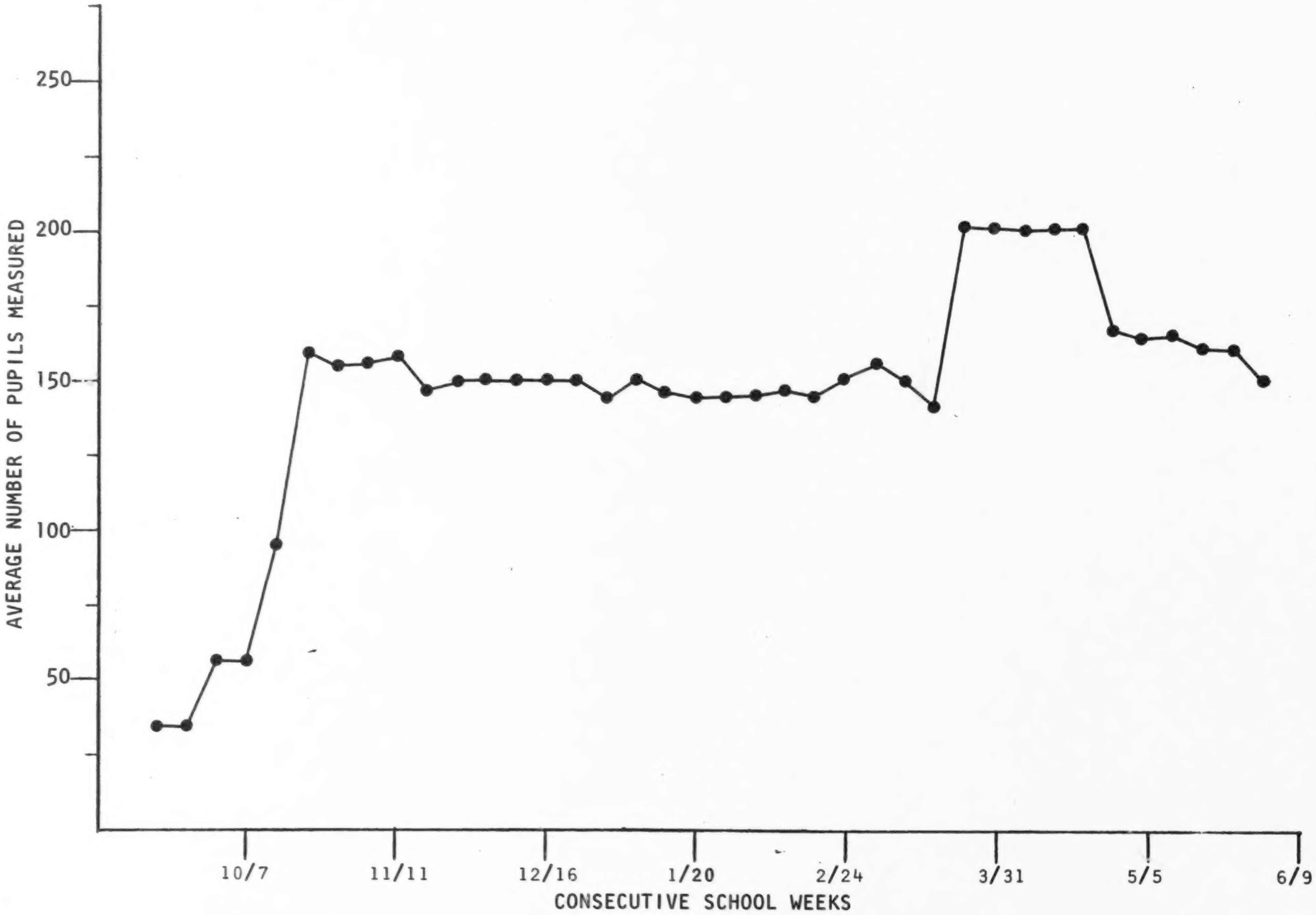

Figure 6. Average number of pupils measured at Graham Hill during the 1968-69 school year.

Sherwood Forest School, Bellevue District

Prior to spring quarter of 1968, the adviser described at a teachers' meeting the purpose of the demonstration project and the functions she would perform as a result of her training. During this same period, a number of Sherwood Forest teachers visited the Experimental Education Unit to become acquainted with contingency management and continuous measurement. In addition, a meeting was held at the Experimental Education Unit involving all school district and University personnel relevant to the demonstration project.

The adviser was assigned to Sherwood Forest School full time spring quarter, 1968. As part of her training in the demonstration project, she had to assist at least three classroom teachers to develop management procedures for individual children, assist a teacher to obtain measurement for an entire class in one academic area, aid a teacher in designing procedures and curriculum materials whereby daily assessments might be obtained, and instruct a teacher to establish some individualized contingency system.

During spring of the 1967-68 year, Sherwood Forest submitted a proposal to the Bellevue School District for a career incentive grant. This proposal, requesting five 4-hour workshop days with pay for their teachers, was funded. Two of the workshop days were scheduled during the summer of 1968 and two other sessions were held during the following school year. The project's assistant coordinator, Mr. John Kidder, conducted lectures on measurement and management techniques. In conjunction with the lectures, Mr. Tal Guppy conducted a demonstration classroom. The other workshop sessions, held during the school year, were conducted by Dr. Eric Haughton, University of Oregon. At these sessions the Sherwood teachers presented and discussed their own measurement projects. A copy of the Sherwood Forest proposal is included in the Appendix.

During the 1968-69 year two programs, a demonstration class and teacher-training program, were instituted at Sherwood Forest School. The demonstration class, conducted by the adviser, comprised nine second-graders selected from the middle reading group of a regular classroom who attended class for one hour each day. The purpose of the class was to demonstrate the use of Sullivan Programmed Reading, self-recording, and self-management.

Each pupil was originally assigned a Sullivan Pre-Primer and taught to correct his answers and write on his event sheet whether his answer was correct or incorrect. If the pupil made an error, he crossed out the incorrect answer and wrote in the correct answer on the answer sheet. The children were instructed to contact the teacher if they could not successfully pronounce a word and upon completion of one of the short tests appearing throughout the books. If the child did not reach a test during a work period, the teacher selected a page already completed by the child and listened to him read that page. The teacher recorded any words missed and reviewed the list at the end of the oral reading. In order to advance from one book to the next, each pupil had to score at least 90% correct on a word recognition test containing the new words introduced in that book. Pre-tests on the words to be introduced were also given before entering a new book.

A data procurement sheet was introduced the first day of class. The children were instructed to write their name on the top line of the data sheet, copy the data from the board onto the second line, and copy the time from the Direct Reading Clock onto the line for "Time Began." They were further instructed to copy the time from the clock onto the data sheet after "Time Ended" when the period was over. The children were then instructed to count the number of pluses and zeros at the conclusion of the period, to total them, and to enter these figures in the spaces provided for number wrong and number right.

The time finder was introduced the second week of class. This device, consisting of two long strips of tagboard attached to the lower part of the blackboard, enabled the pupils to evaluate the total time spent on the program. The children were instructed to write this number after Total Time on their data sheet.

During the seventh week, the children were given 6-cycle log graphs and taught to read their own correct and error rates, then plot their own rates, and finally, to interpret these rates. On the eleventh week the teacher taught the class to use rate plotters for calculating their own correct and error rates. In the 23rd week, the children were returned to their regular classroom with their reading materials and self-management procedures. The only change in the procedures involved skipping the tests and oral reading samples.

The teacher-training program at Bellevue included a four-stage sequence for each of the 20 teachers. Teachers progressed individually, dependent upon their ability to successfully complete each project. The first assignment required measuring a social behavior of a single child; the second and third projects required measuring an academic behavior. The fourth assignment required obtaining daily performance measures from an entire class in a single academic area.

Prior to the first assignment, the adviser met with each teacher and explained how to pinpoint a behavior to be altered. The criteria for selecting a behavior were that it be observable and occur freely. If a teacher initially specified "talk-outs" as the target social behavior, the adviser assisted her to define the behavior so that she recorded from day-to-day the exact same event. The teacher and adviser discussed such matters as when to record the behavior and how to obtain a record of the behavioral event. The adviser also taught the teacher how to calculate rate.

After this instruction, the teacher was told to gather five days of data, compute the rate, plot the data, and contact the adviser. The adviser now demonstrated to the teacher how to plot the data on 6-cycle log paper and using these data, discussed with the teacher the extent of the problem. In those cases where the pinpointed behavior occurred at a rate warranting change, possible alterations were discussed. When a teacher specified a change that she would impose to alter this rate, she was instructed to institute that change and only that change for five days, and to continue to measure the rate at which the pinpointed behavior occurred.

When the change had been in effect for five days, the teacher once again contacted the adviser. Together they analyzed the data by computing a median rate for the initial phase of the project and a median rate for the change phase. Based on these data the teacher decided whether to continue measuring the behavior with the initially imposed change in effect, introduce a new change, or withdraw the change.

The 20 teachers selected the following social targets: talking to neighbor, talk-outs, rocking in chair, hitting other children, pushing other children at the coat rack, out-of-seat, turning head to back of room, contacting others with elbow and hand, looking away from reader, and turning self around in chair.

The second assignment was pinpointing an academic behavior and recording the initial rate of that behavior. If the behavior warranted a change, they were to alter something antecedent to the situation. The academic behaviors selected could be in any curricular area such as reading, writing, mathematics, or social studies. The antecedent events (those events or circumstances that arise prior to the pupil's response) could be teacher instruction, seating arrangement, or curricular revision. As during the social project, each teacher obtained data pertaining to the pinpointed behavior for five days, then contacted the adviser. The adviser and teacher evaluated the data and discussed first, whether a change was necessary and second, which antecedent events, if altered, might affect the rate of that behavior. Following five days of data obtained under the new condition, the teacher again scheduled an interview with the adviser to evaluate the effectiveness of the imposed alteration. On the basis of these data the project was either continued without alteration, the change was withdrawn, or a new change was instituted. Of the 20 teachers, sixteen selected academic targets in the area of math, one selected handwriting, and three selected reading.

The third assignment for each teacher again required assessing and changing an academic behavior, and also manipulating a subsequent event. The same procedures were used. The teachers first pinpointed an academic behavior and measured its rate of occurrence for five days. Then an interview was arranged with the adviser to discuss whether or not to change the behavior, and if so, what to alter. If a change in the behavior's rate was desired, the teacher manipulated an event that followed the pupil's performance--for example, making leisure-time reading or recess contingent upon acceptable academic performance. Of the 20 teachers, fourteen selected math, one selected reading, four selected handwriting, and one selected spelling.

The fourth assignment required that each teacher select one academic area and obtain daily rate measures from all of her pupils. Furthermore, in all of the classes except kindergarten, the teachers were required to instruct the children to obtain their own daily measurements. For this assignment, the teachers were required to obtain 10 days of data during an initial phase and 10 more days of data after some environmental change had been imposed. Throughout this assignment the teachers were required to obtain daily correct and error rates from each pupil and plot these on individual graphs. In addition, they were requested to plot correct and error rate ranges that reflected the variability of the group performance and to calculate daily median correct and error rates for the group.

The initial problem of this assignment was to select an academic area that could actually be measured. Often academic materials such as basal texts or workbooks do not lend themselves to measurement because no active or observable responding is required. In those cases, revisions or adaptations had to be made before data could be obtained. In other instances particularly mathematics, the materials are not properly sequenced. For example, mathematics sheets often contain problems of varying length and complexity. Furthermore, some math books are arranged so that the first problem involves the subtraction process, the next addition, the next multiplication. When materials are not properly arranged so that the units of responding are similar, program revision is necessary.

Figures 7 and 8 illustrate the results of the Bellevue program. Figure 7 reveals the weekly number of teachers involved in the program, while Figure 8 indicates the average number of pupils being charted each week. Bellevue's program for the third year of the project will be under the direction of Dr. William Mattick, director of pupil personnel. The adviser will extend and expand the Sherwood Forest program of the previous year. Dr. Thomas Lovitt will work with Miss Casperson in extending the program to include the Medina Elementary School and continuing the program at Sherwood Forest.

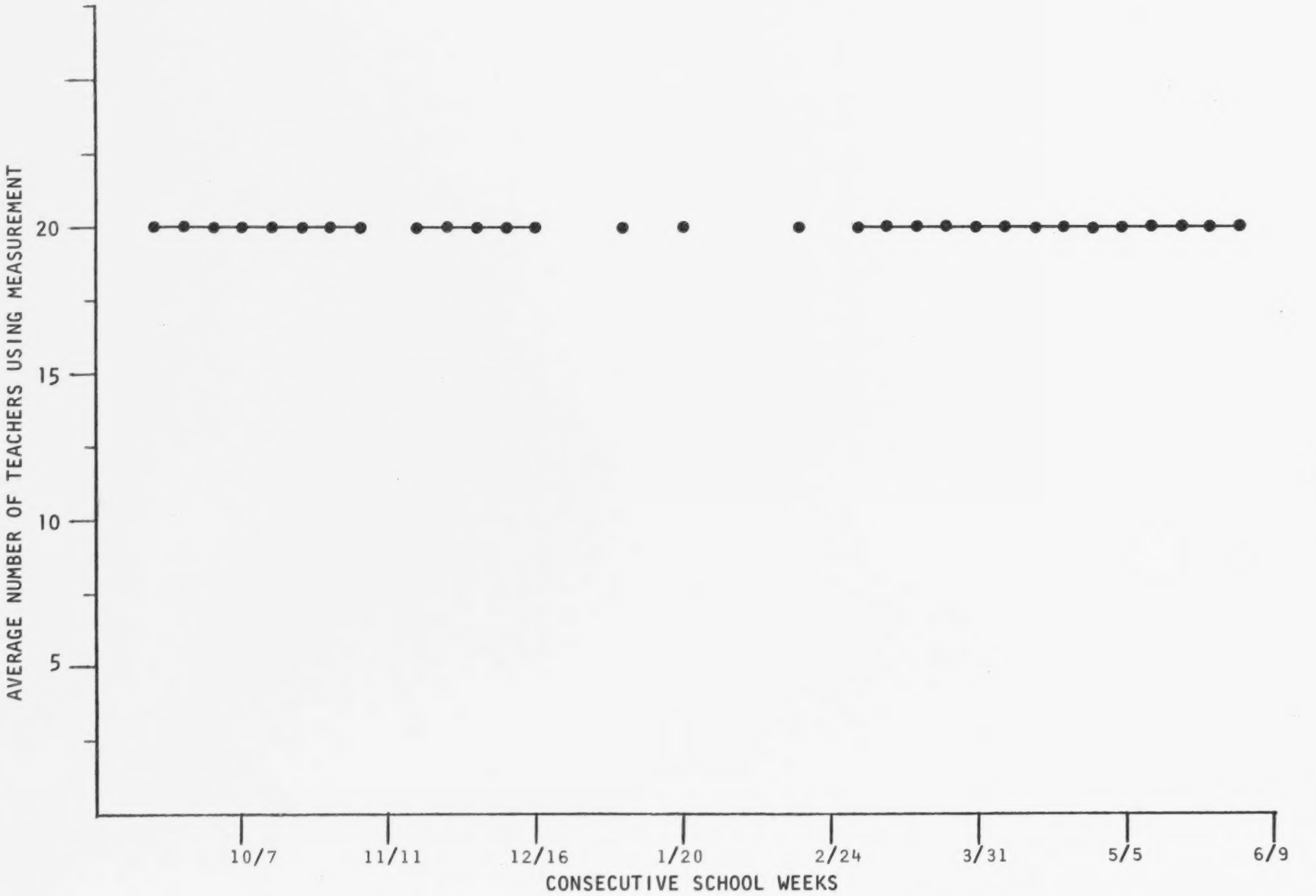

Figure 7. Average number of teachers using measurement at Sherwood Forest during the 1968-69 school year.

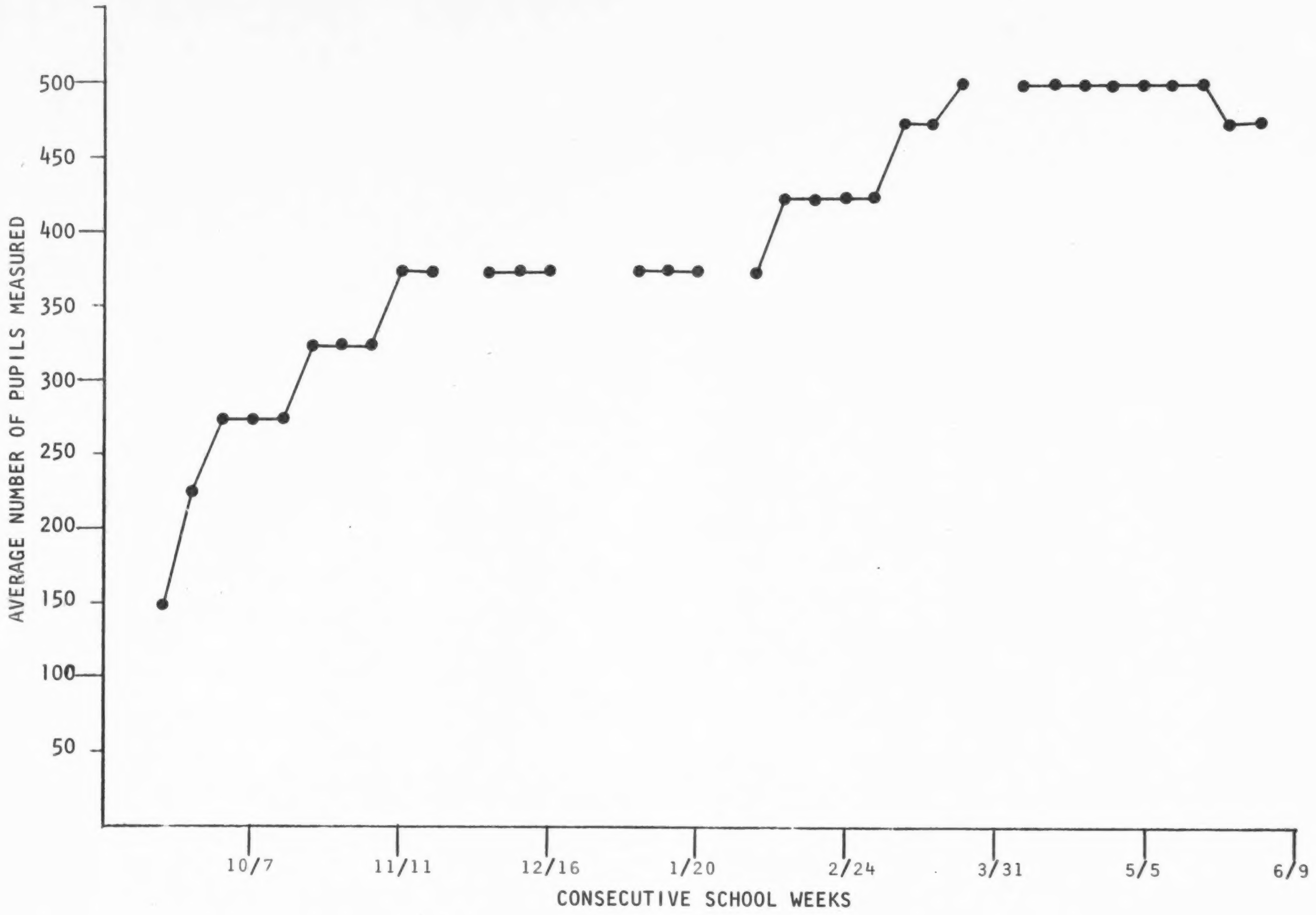

Figure 8. Average number of pupils measured at Sherwood Forest during the 1968-69 school year.

Part VI

RESULTS

This section, organized in five parts, presents selected behavior management projects from the four schools. Section I presents projects involving managerial situations, which pertain to the measurement and alteration of such behaviors as out-of-seat, talk-outs, or hitting others. Section II describes academic projects concerned with measurement and alteration of reading, mathematics, or spelling of individual pupils. Section III presents academic group projects involving an entire class, where an academic event such as reading, mathematics, or spelling was measured continuously. Section IV presents data from a questionnaire submitted to all teachers in the four sites at the close of the project. Section V presents administrative data--the rates at which the adviser contacted the manager, the trainer the adviser, the principal his teachers, and the adviser the principal.

Managerial Projects

Project 1

This project studied a kindergarten boy who shouted out for attention instead of raising his hand. Often during the individual work period he shouted at other children and then quickly looked at the teacher to observe her reaction. During the lesson period he often volunteered information in a very loud voice before being called on. These shout-outs were frequently followed by teacher admonishment and peer attention. The teacher took six days of baseline information and then began modification--not attending to the shout-outs and praising pupils who also ignored them. In addition, the teacher called on the boy as soon as he raised his hand. Within six days the rate of shout-outs had decreased to near zero and the teacher expressed satisfaction with the boy's general classroom manners. Figures 9 and 10 show the results of this project.

Project 2

The aim of this project was elimination of a third-grade girl's attention-seeking (being out of her seat, talking, touching others, and raising her hand) which generally disrupted the classroom and prevented the girl from completing her work. As shown in Figures 11-14, three days of baseline information revealed a high rate of attention-seeking. The first modification attempt, changing the girl's seat, had little or no decelerating effect on these activities. Self-recording, an individualized program of instruction, and social reinforcement for not engaging in these behaviors did have some effects on decelerating the four activities. But a time-out contingency proved most effective in attenuating attention-seeking.

Project 3

The concern of this managerial project was a second-grade boy who pushed others at the coat rack when he came in from recess. According to the teacher's observations, taken 5 minutes daily for 5 days, the boy's median rate of pushing others at the coat rack was 1.7 per minute. During the first intervention phase, the teacher reminded the boy, prior to going out for recess, not to push others when recess was over. This procedure had some decelerating effect; the boy's median rate of pushing dropped to .2 per minute. During the second modification attempt, another five-day period, the teacher gave the same instructions prior to recess; but in addition she praised the boy for good behavior if he interacted appropriately at the coat rack. The data for the second modification phase revealed that his median rate of pushing others upon arrival from recess was zero. Figure 15 shows the results of this project.

Project 4

The pupil in this project was a second-grade boy; the target behavior was his rate of hitting others upon arrival at school. The data, recorded 5 minutes each day for 5 days (see Figure 16) revealed that the boy's median rate of hitting others was 2.2 per minute. During the modification phase, when the teacher requested the boy to tally his rate of hitting others, this behavior dropped to 1 per minute. On the eighth day of the modification phase the student tore up his records, saying that he didn't need a chart any longer. The teacher, however, continued to record the boy's rate of hitting others and praised his good behavior. The data revealed that after the eighth day, the subject no longer hit children.

Project 5

This project concerned a first-grade boy who talked out during work period. As shown in Figure 17, the teacher recorded the rate of this activity for 10 minutes daily. Throughout a five-day initial phase, the data revealed that the boy talked out at the rate of 1.2 times per minute. During the modification period, the teacher told him if he did not talk out during the work period, he would be allowed to paint. Thereafter his rate of talking out decelerated and in the final 5 days of the project was zero.

Project 6

The target behavior of this project was the rate at which a sixth-grade boy turned around in his seat (see Figure 18). The teacher recorded this activity for 5 minutes each day. During the initial observation phase of 4 days the boy's rate of turning around was .9 per minute. The teacher then changed the child's seat so that his desk faced the wall. As a result, the boy's rate of turning around decreased to .1 per minute, with the final 4 days at zero.

Project 7

This project, represented in Figure 19, modified the behavior of a boy in a third-grade class who was frequently out of his seat. During the baseline period of 7 days, the teacher ignored this behavior but recorded its frequency. The median rate of being out of seat was .2 per minute. During the second phase the teacher allowed the boy to carry the gym key during physical education period if no out-of-seats occurred. As a result, his rate of being out-of-seat immediately declined to zero.

Project 8

This project was concerned with a six-year-old kindergarten boy who talked out. As shown in Figure 20, the teacher first recorded each talk-out during a twenty-minute observation period for 8 days. In the second phase the child was given the option of being the class messenger whenever he talked out twice or less in the twenty-minute observation period. The results revealed the boy's rate of talking out was .05 times per minute, in contrast with a median rate of .3 in the first phase. A second intervention attempt was then made employing contingent teacher praise. The median rate remained .05 times per minute; but on 4 days the boy's rate of talking out was zero, in contrast with no days of zero talk-out rates in the first intervention phase.

Project 9

This managerial project differed from the previous examples in that an academic response was measured in addition to the managerial behavior. During the initial 5 days, the teacher recorded the girl's disruptive rate--crying, hitting, and shouting out. She reacted to these behaviors by telling the child not to behave as she did. Her rate of disruptive behavior during this phase was about .44 movements per minute. During the second five-day phase, the teacher ignored disruptive behavior and attempted to attend to "good" behaviors. The data revealed that her median rate of disruptive behaviors was .05 movements per minute. A third phase was then scheduled, a return to baseline conditions. The teacher attended to the disruptive behaviors by pleading with the child and telling her not to do these things. In addition, throughout this phase the teacher recorded academic response rates by tabulating the number of correctly written letters and dividing these by the total program time. The data revealed that the girl's rate of disruptive behaviors during phase three was 1.5 movements per minute, and her rate of writing correct letters was .81 A fourth phase was then programmed, at which time the teacher ignored the disruptive behaviors as she had during the second phase of the project. Meanwhile, she attended to good academic behavior by circling on the girl's page each correct written letter. The data revealed that the girl's rate of disruptive behaviors during this fourth condition was .15 per minute while her rate of writing letters was 6.1 per minute. The results of this project are shown in Figure 21.

Project 10

The subject of this project was a five-year-old boy in a kindergarten class. For three days, three behaviors were observed over an observation period of two and a half hours (see Figure 22). These three behaviors were destroying things, getting in the teacher's desk, and hitting other children. During the intervention phase each of these behaviors was consequated with a period of time-out. Whenever the child hit others, got into the teacher's desk, or destroyed other people's property, he was immediately placed in time-out for a period of approximately 30 seconds. The teacher, in addition to measuring the three consequated behaviors, also indicated the rates of two non-consequated behaviors. The latter group of behaviors included throwing objects and hitting self. The data revealed that throughout this modification phase the three consequated behaviors were eliminated. The data further revealed that the non-consequated behaviors, throwing objects and hitting self, were only minimally affected.

Project 11

This project studied a fifth-grade student, age 10, in a regular fifth-grade class (see Figure 23). The target behavior was the boy's rate of talking out. Throughout a five-day baseline period the teacher counted the rate of this behavior for 120-minute periods. The data revealed that the boy talked out at a median rate of about .7 times per minute. During the first intervention phase, the teacher and pupil agreed that an ice cream bar would be granted the boy if .08 responses or less occurred per minute (10 or less in 120 minutes). Throughout this five-day intervention phase the pupil's median rate was .08 movements per minute. Finally, a five-day withdrawal phase was scheduled, during which the boy's rate of talking out continued to drop, even though the ice cream contingency was no longer in effect.

Project 12

This project involved two boys in a regular second-grade class who fought with each other. These fights were observed daily for 345 minutes.

During a five-day baseline phase; the median rate of fighting was about .02 fights per minute. During phase B an "etch-a-sketch" was introduced. Prior to recess each day the two boys were seated with the etch-a-sketch and were told to draw or write the word "friends." When the boys had successfully written the word "friends" they were given an ice cream cone. The data revealed that during this five-day intervention phase the median rate of fighting was .003 per minute. A second intervention phase was established in which the boys had to write the word "friends" on their etch-a-sketch within 10 minutes before they were given ice cream. A withdrawal phase (no ice cream) was then instituted. The data revealed that throughout this five-day phase the boys did not fight. The results of this project are shown in Figure 24.

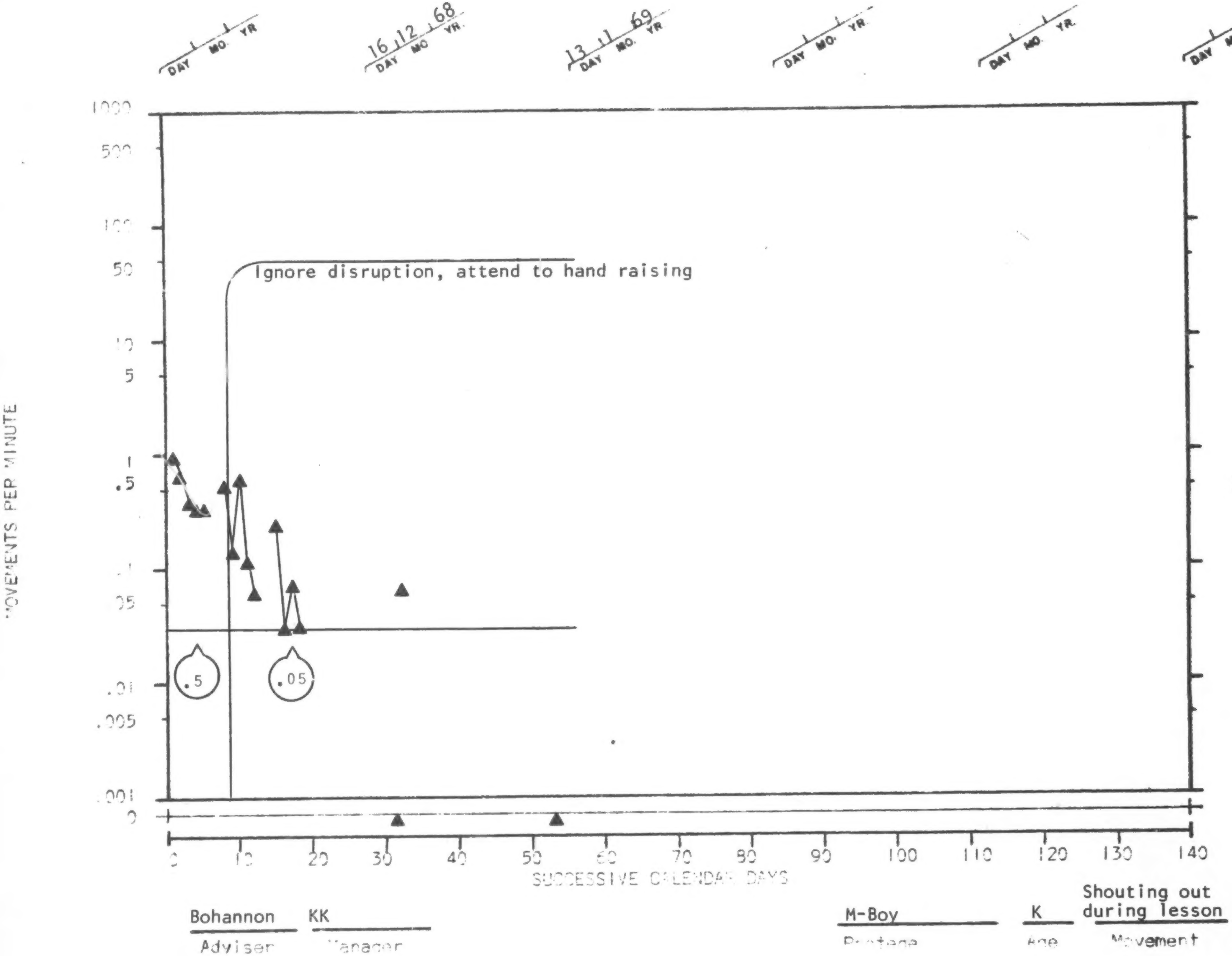

Figure 9. Deceleration of a boy's shouting out during lessons.

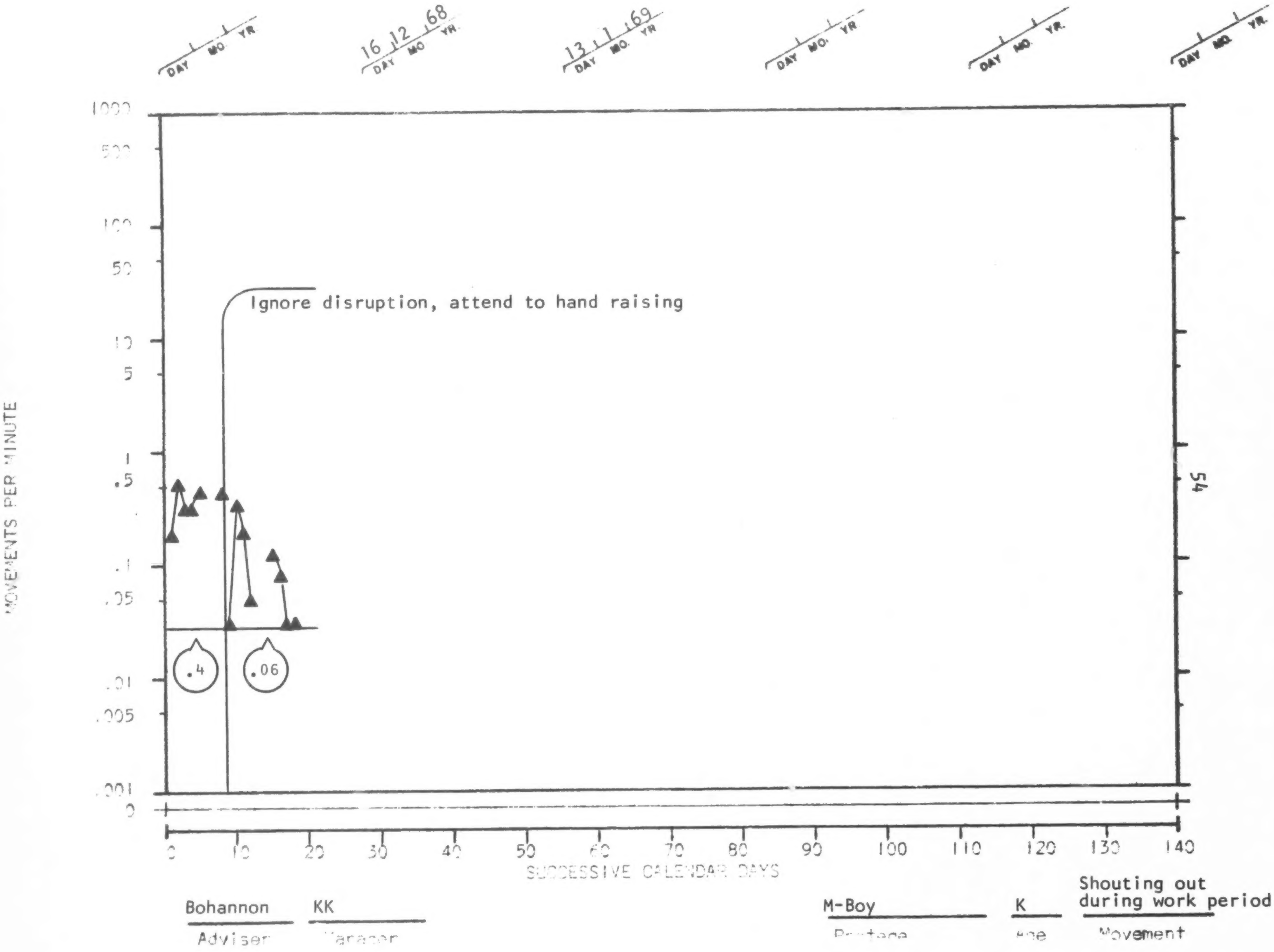

Figure 10. Deceleration of a boy's shouting out during work period.

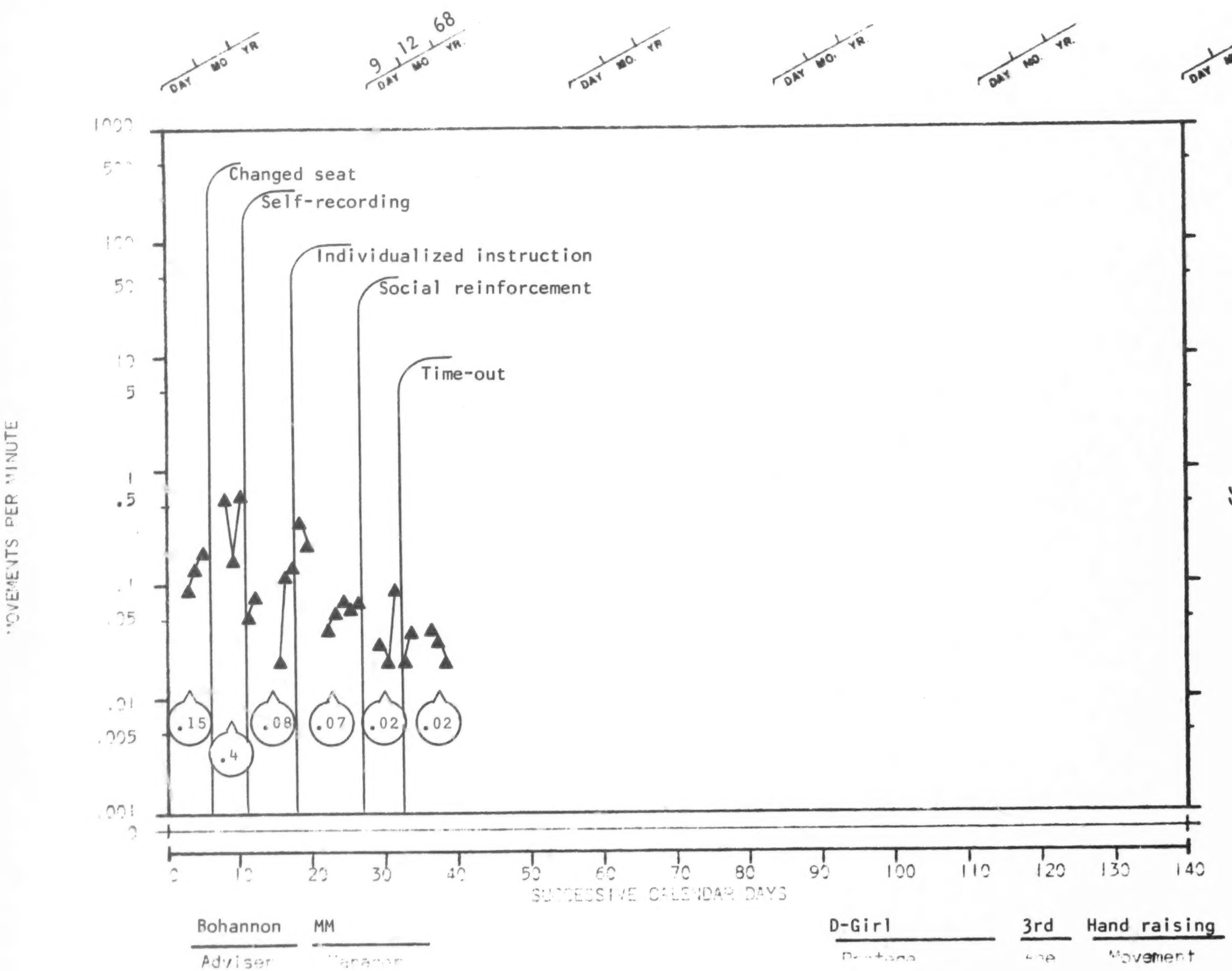

Figure 11. Deceleration of inappropriate hand raising.

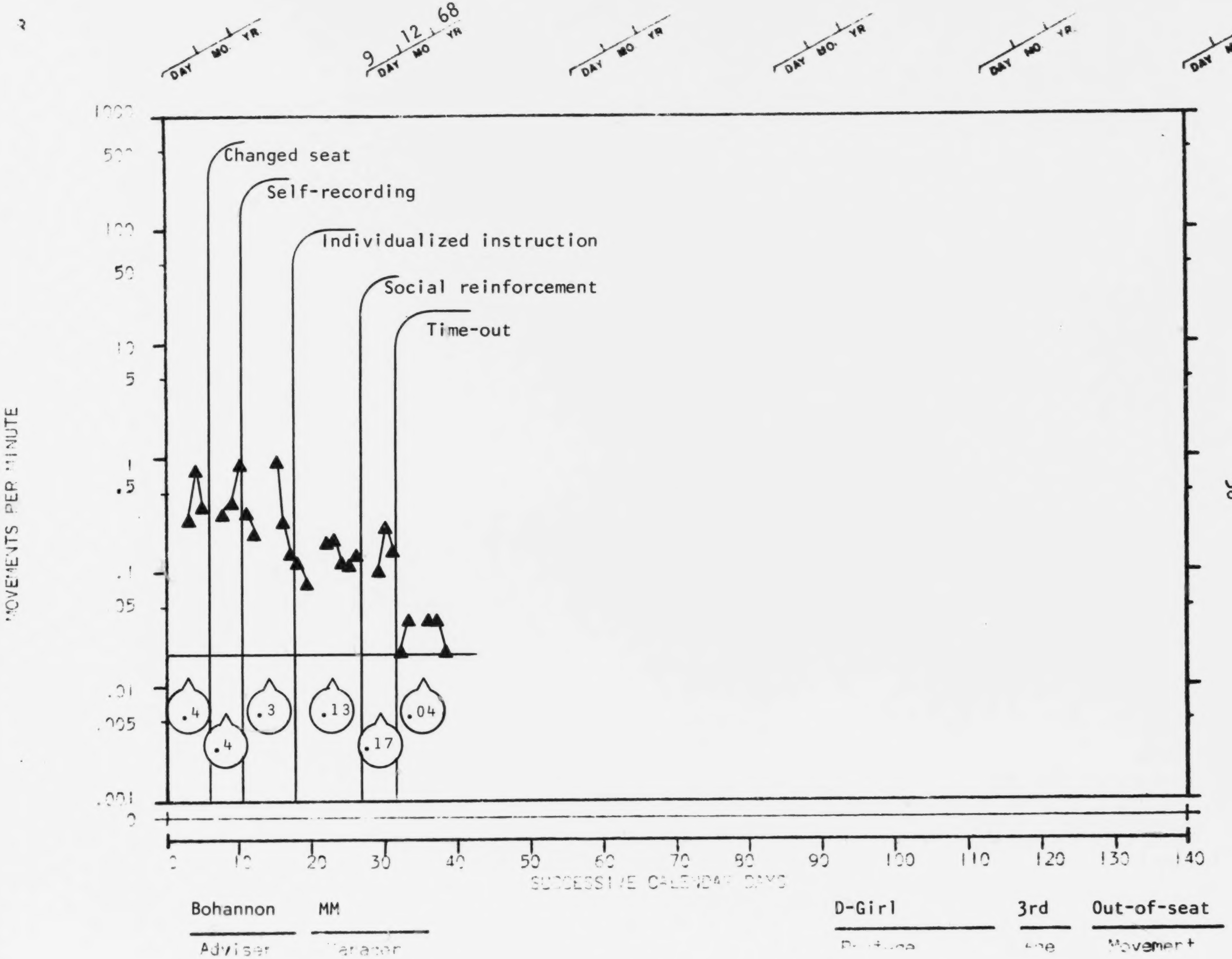

Figure 12. Deceleration of being out-of-seat.

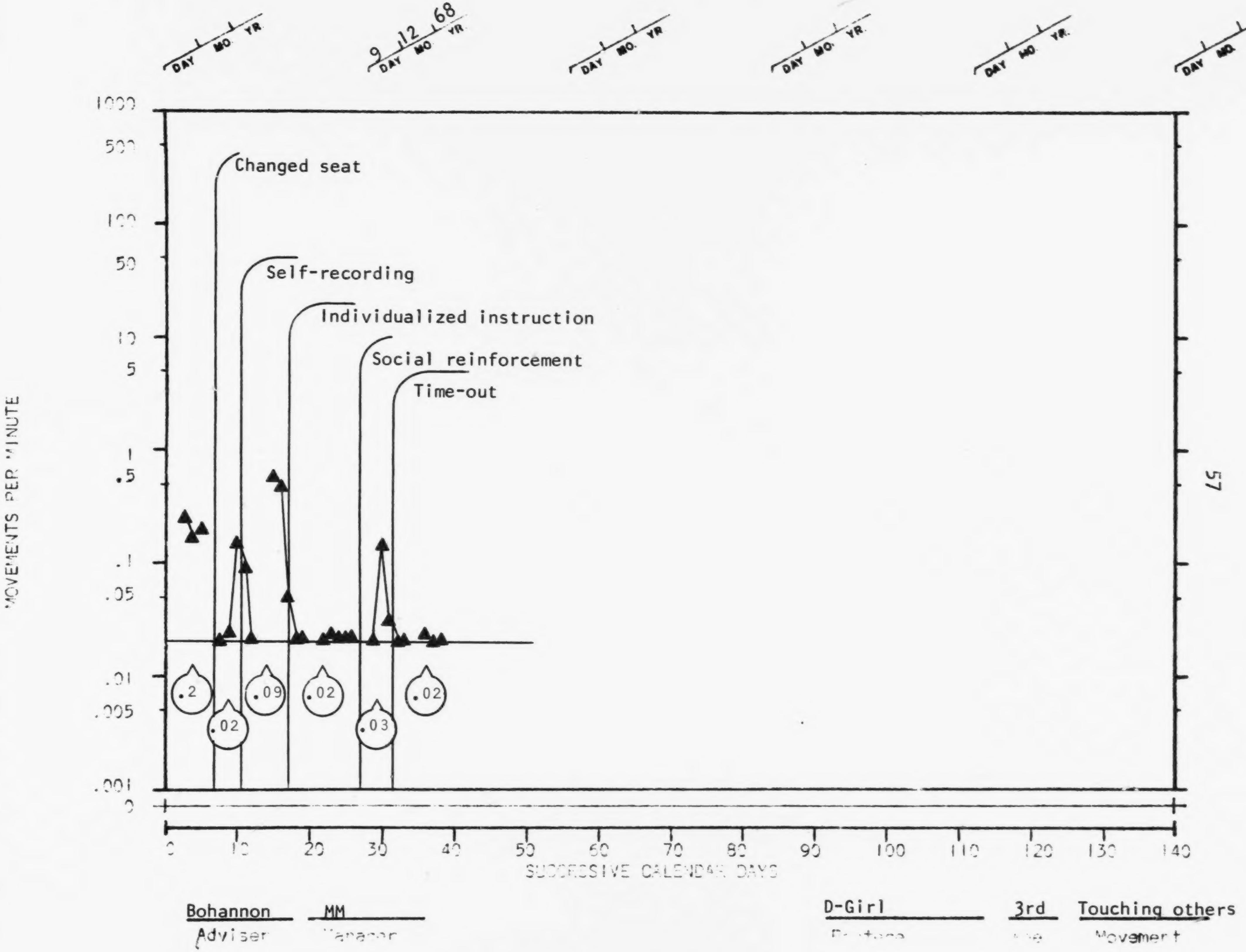

Figure 13. Deceleration of touching other children.

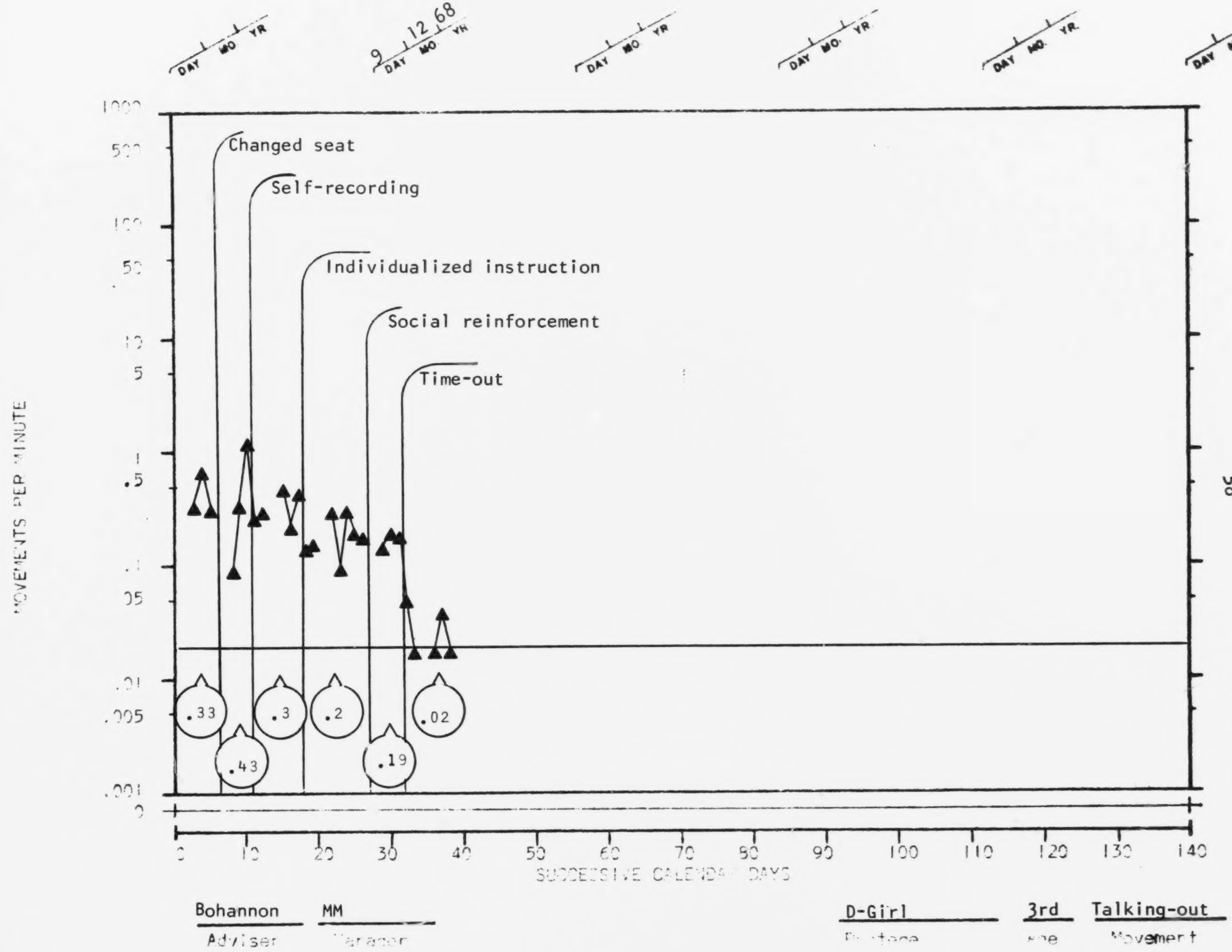

Figure 14. Deceleration of talking-out.

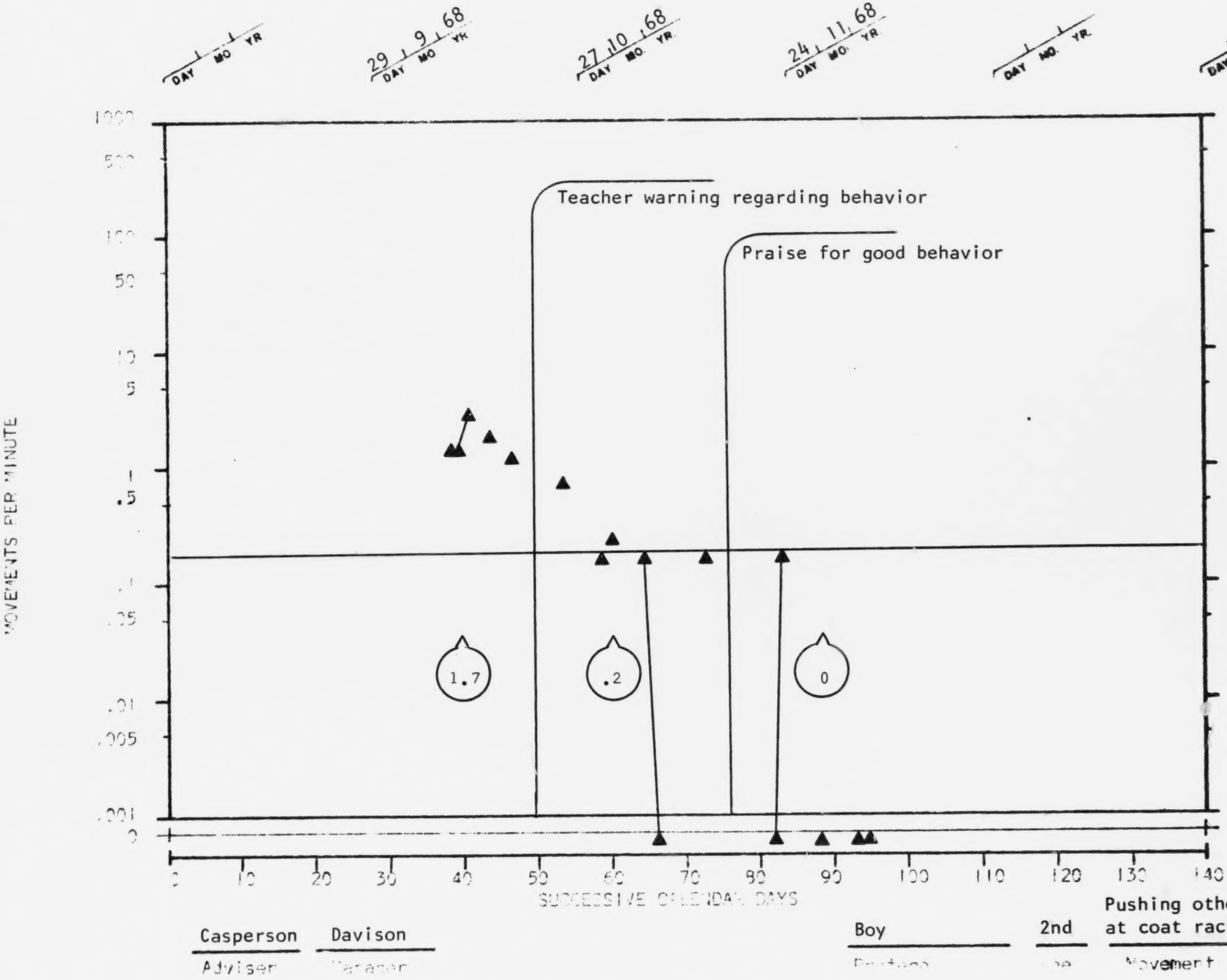

Figure 15. Deceleration of pushing others at the coat rack.

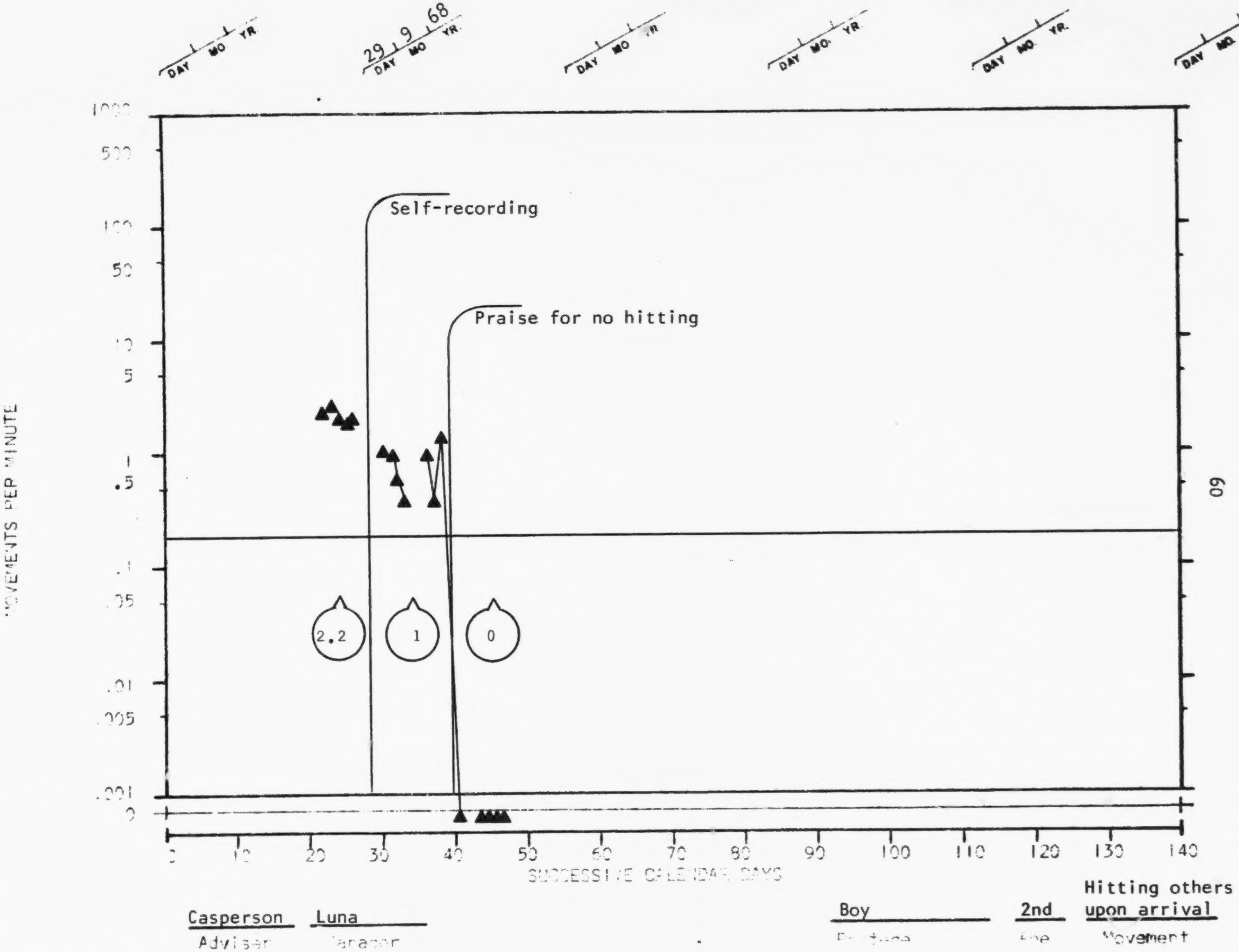

Figure 16. Deceleration of a boy's rate of hitting others.

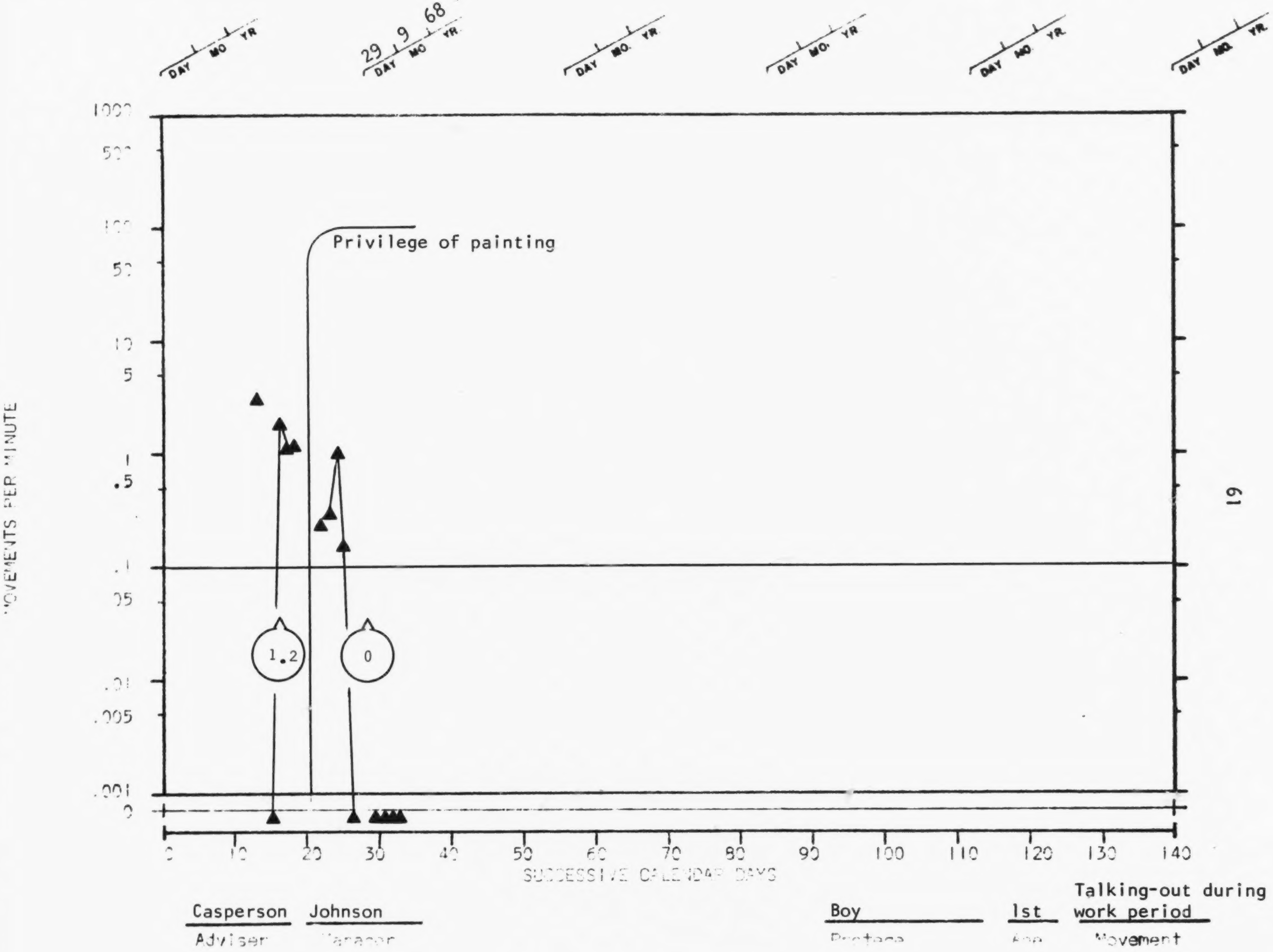

Figure 17. Deceleration of talk-outs.

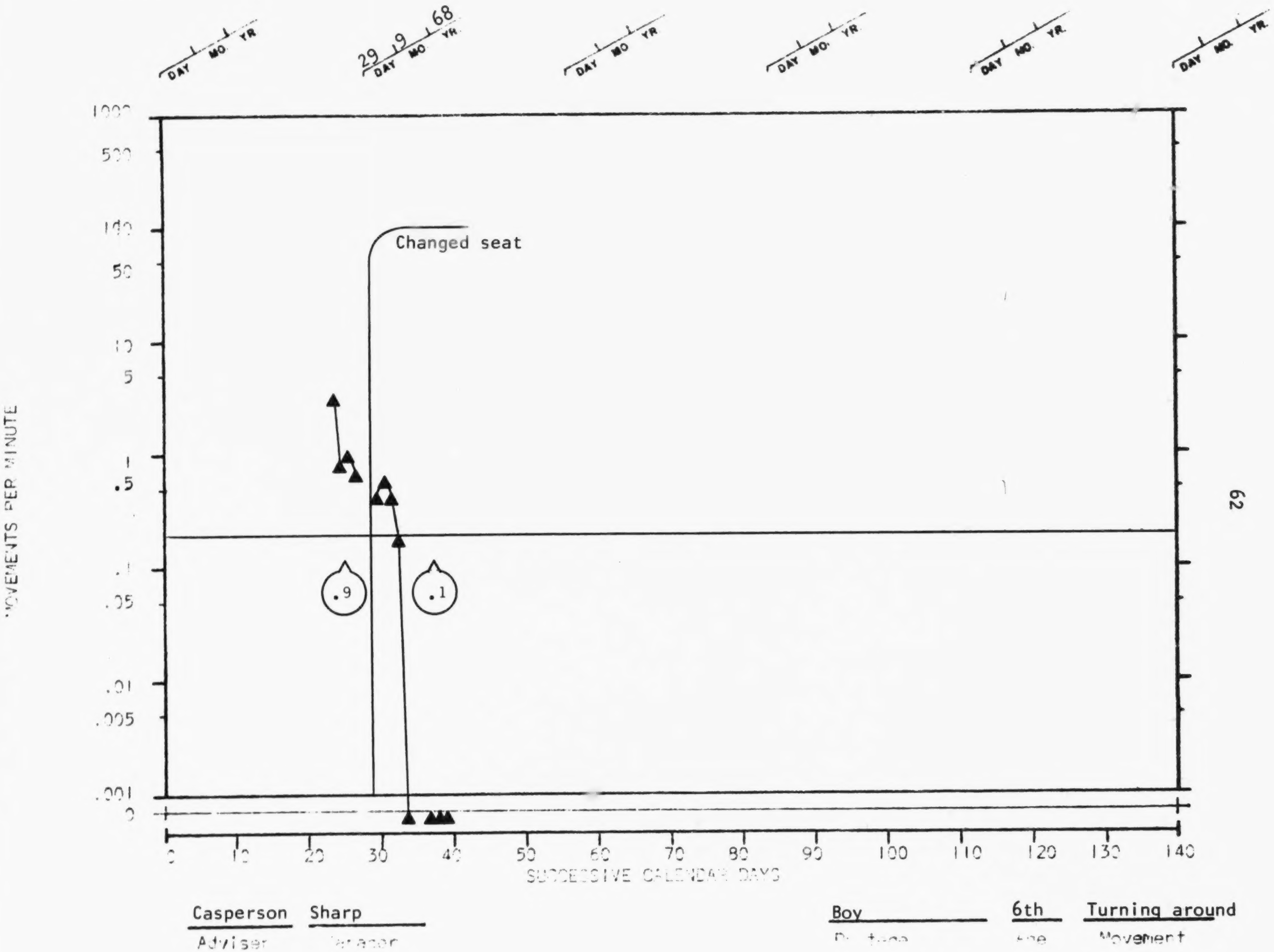

Figure 18. Deceleration of a boy's turning around in his seat.

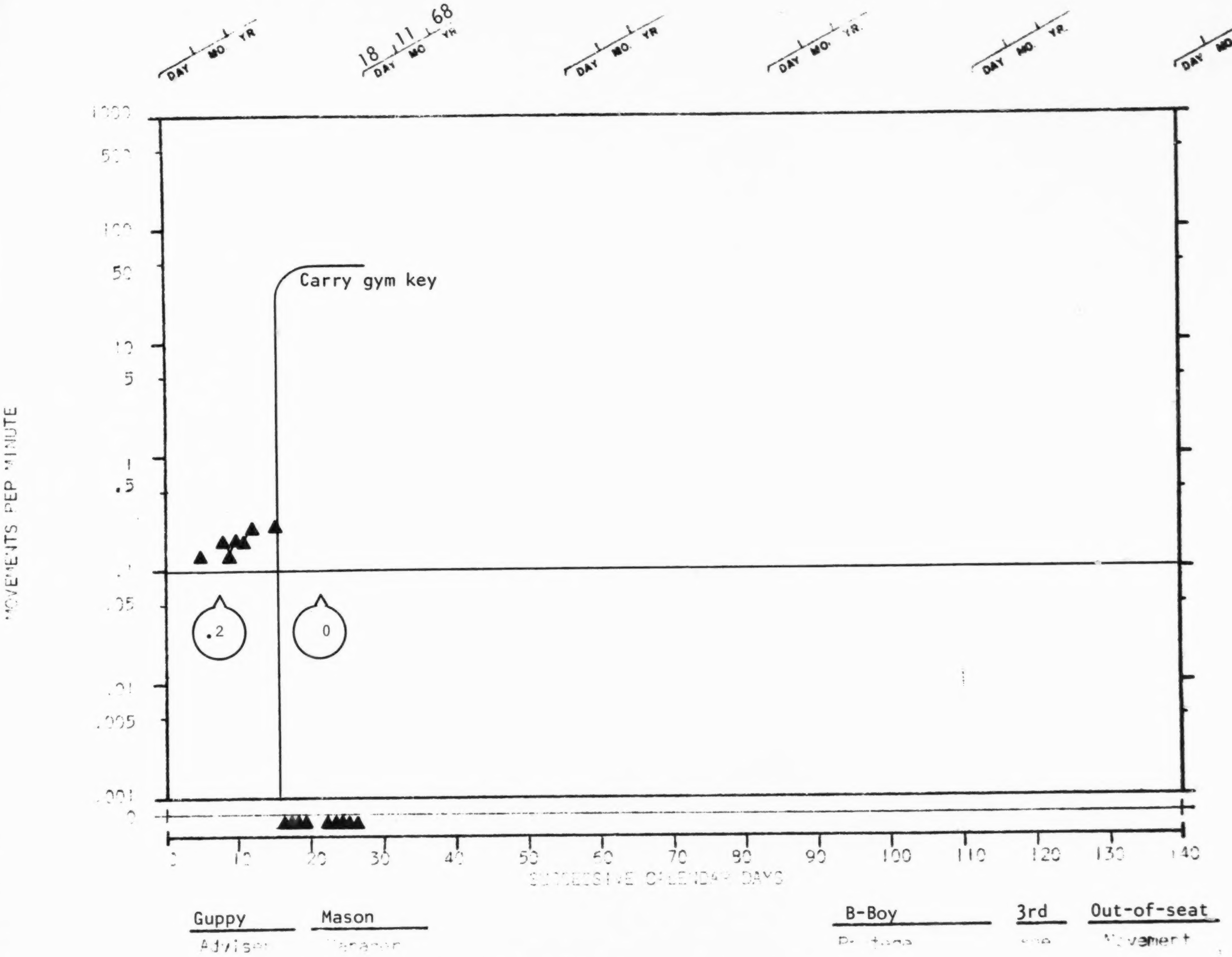

Figure 19. Deceleration of a boy's getting out of his seat.

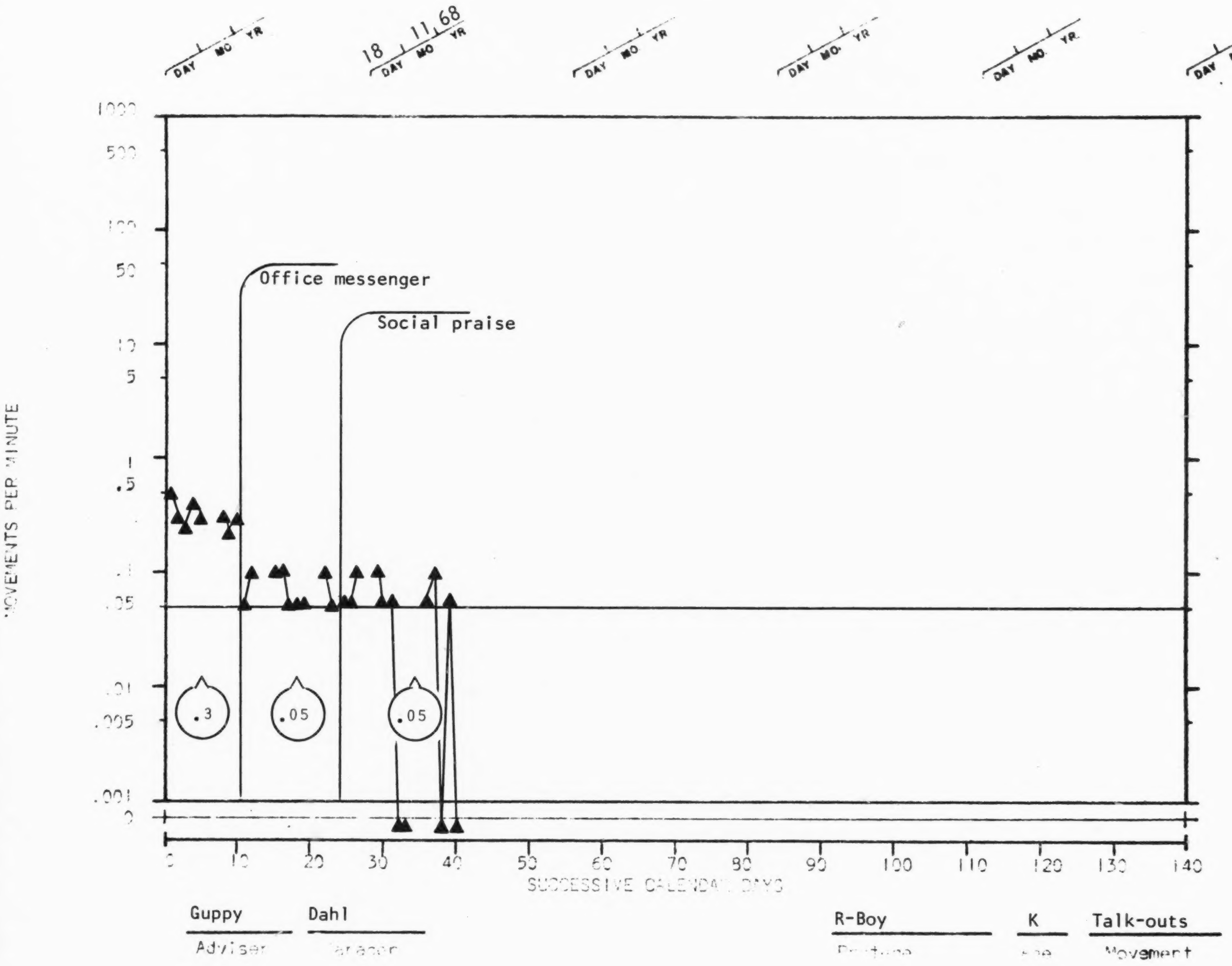

Figure 20. Deceleration of talk-outs.

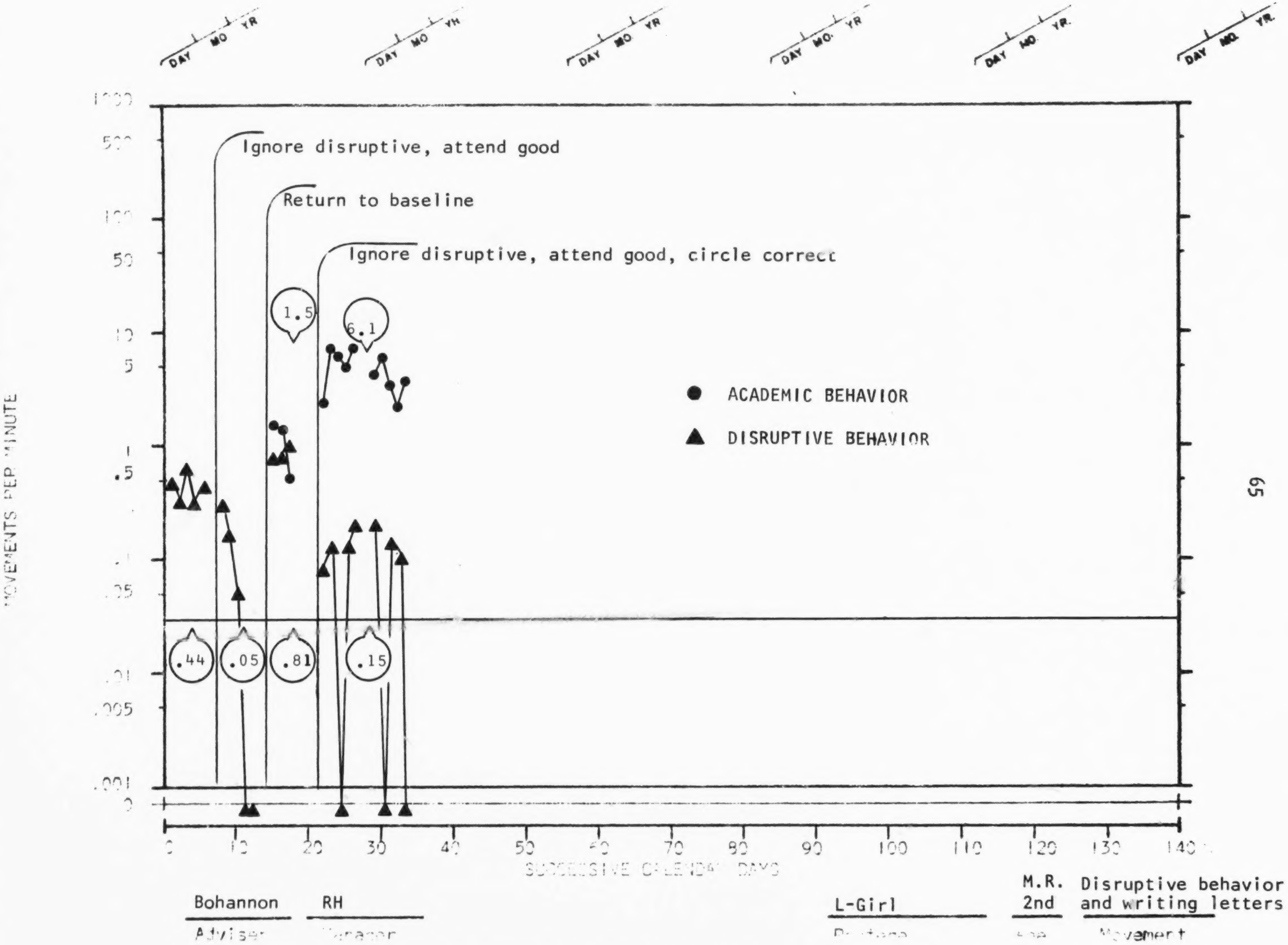

Figure 21. Deceleration of disruptive behaviors and simultaneous acceleration of writing letters.

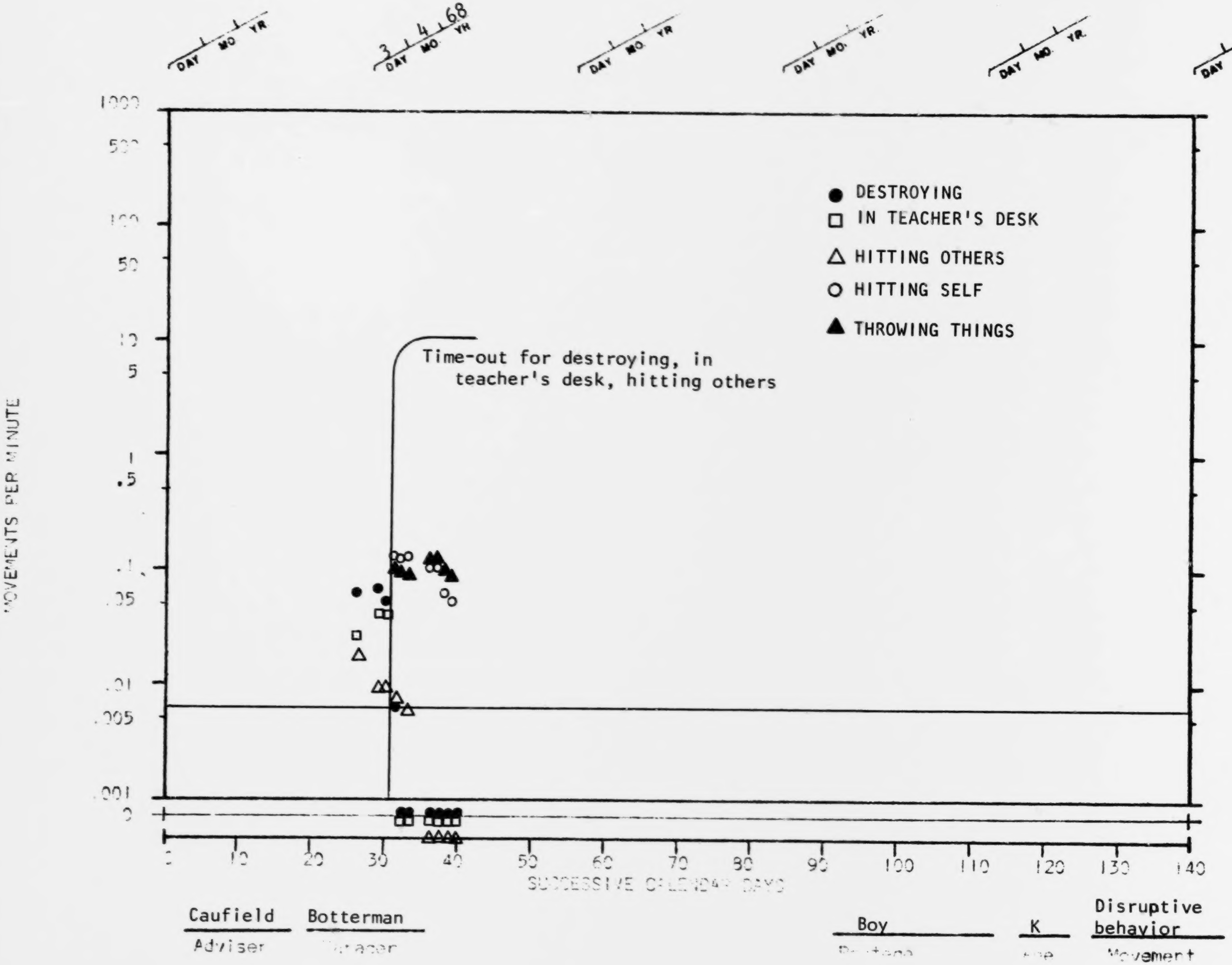
Time-out for destroying, in teacher's desk, hitting others

Figure 22. Deceleration of several disruptive behaviors of a five-year-old boy.

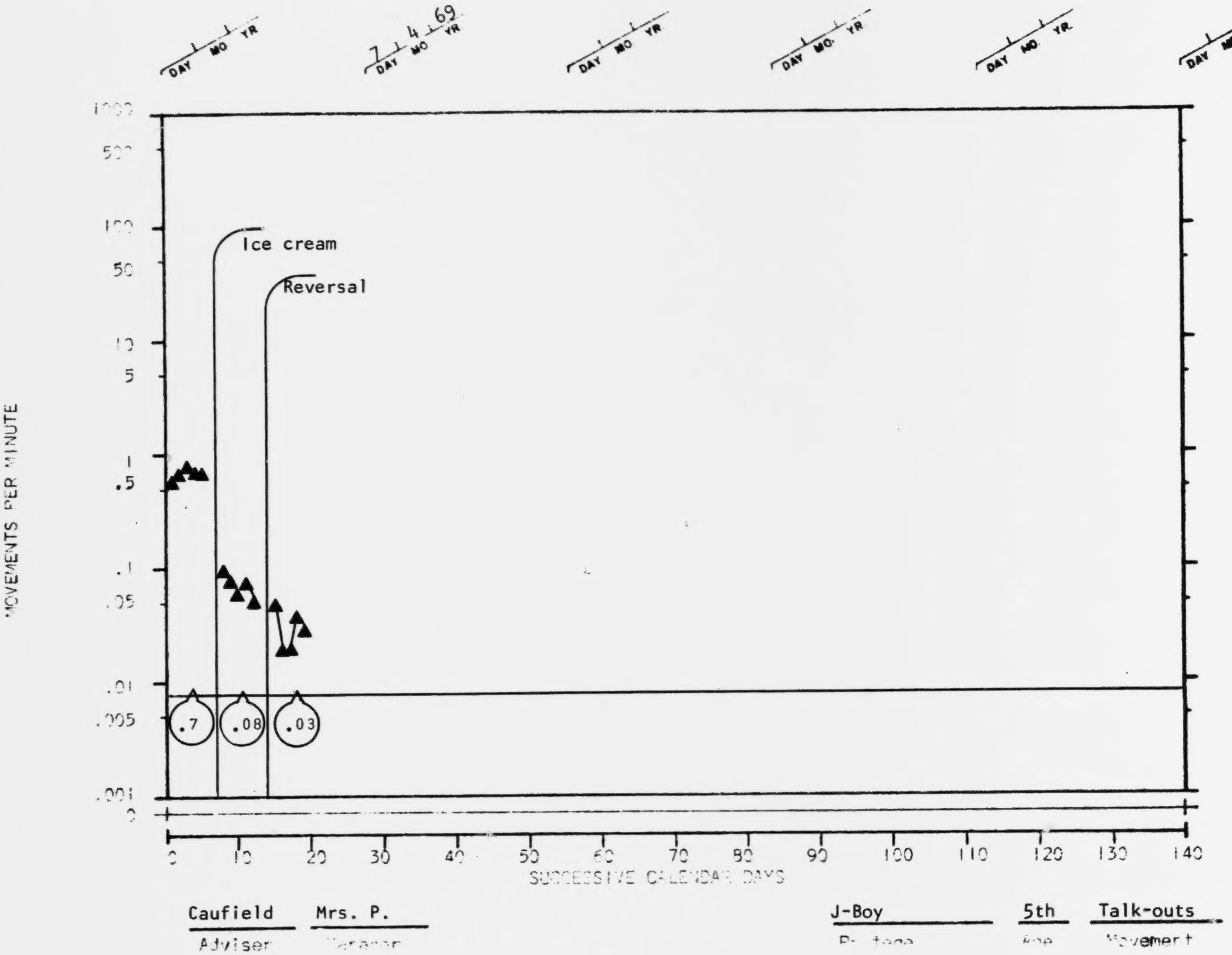

Figure 23. Deceleration of talk-outs.

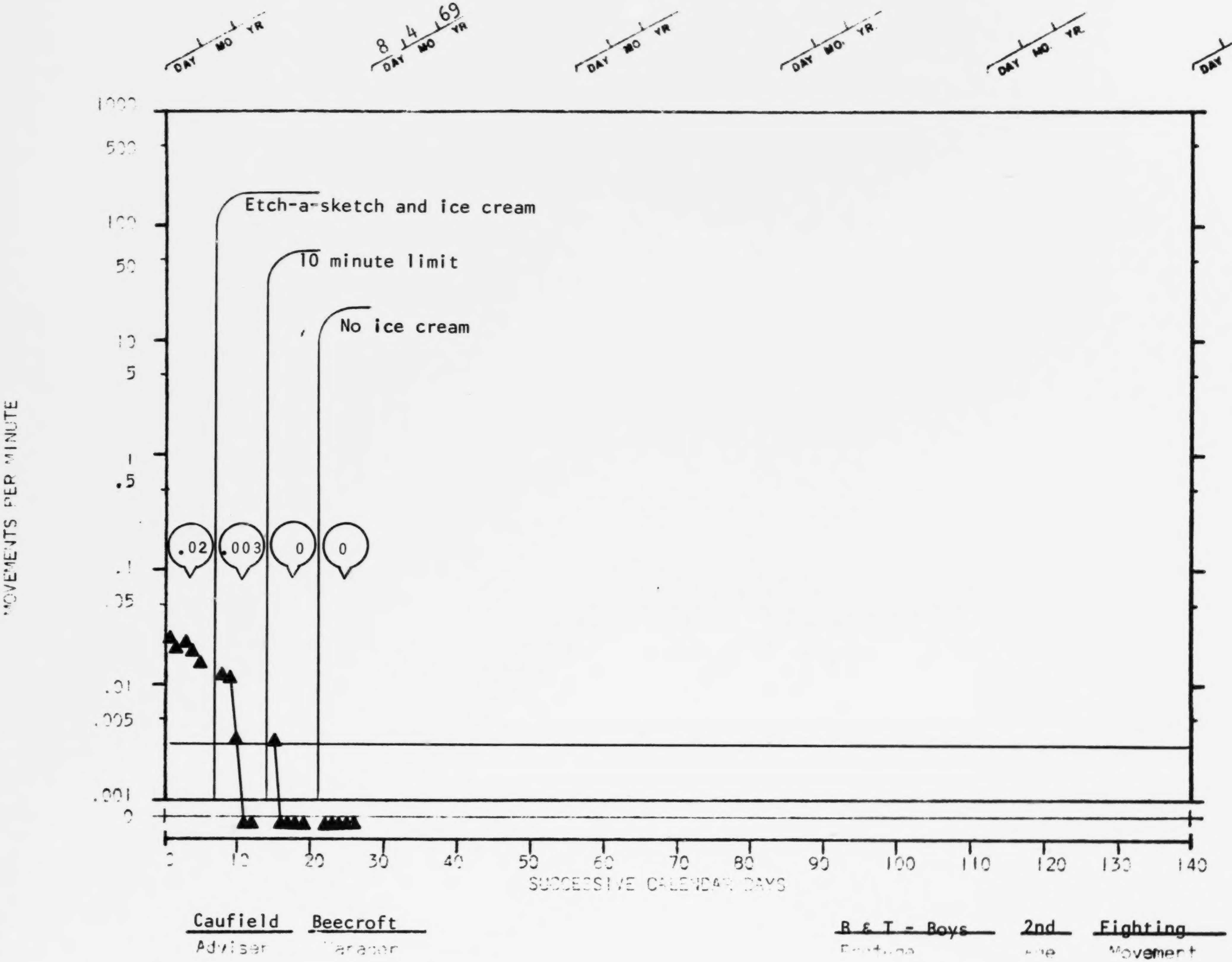

Figure 24. Deceleration of fighting between two second grade boys.

Academic Projects

Project 1

A first-grade boy was the subject of this project and handwriting the target behavior. For a six-day initial phase the writing assignment was placed on the board each day and the teacher recorded the subject's correct and error responses (see Figure 25). His correct rate was 2.6 letters per minute and error rate 5.6. During the first change phase the teacher provided more definite instructions to the class and gave more individual help to each of the pupils. During this five-day period the boy's correct rate of writing letters was 5.5. His error rate decelerated to 2 incorrect writing responses per minute. In a further effort to increase the correct rate, the teacher instituted a second change phase. Now when the assignment was given to the class, the letters were grouped according to similarity. In other words, the letters c, e, and o were presented together. Throughout this five-day period the boy's correct rate rose to 8.4 responses per minute. His rate of errors, however, rose to 3.3 per minute. In the third change phase the teacher drew on each of the pupil's pages a model of the letters they were to print for that day. She also dotted in letters they were to trace. Throughout this five-day phase the pupil's correct rate was 6.4 answers per minute and his error rate 1.4.

Project 2

This project was a mathematics study conducted by a first-grade teacher with a six-year-old boy (see Figure 26). The boy was requested to put either > or < between two numerals, 0 through 9. During the initial five-day phase his correct rate of placing these symbols between the numerals was .7 per minute. His error rate, however, was .9 per minute. During a change phase the teacher lessened the program requirements so that he was required to insert the symbols > or < only between numerals 0 through 5. During the change phase his rate of correct answers rose to 1.6 answers per minute, while his error rate was zero. In the third phase of this project the numerals 0 through 9 were once again programmed. The boy's rate of correct answers remained 1.6 answers per minute and his error rate zero.

Project 3

This project was scheduled for a second-grade girl. During an initial five-day period the teacher presented a combination of mathematics facts, ranging from single-digit problems where the sums were less than 10 to 3-digit addends. Her median correct rate throughout phase A was .6 responses per minute, while her error rate was .18 responses per minute. In phase B, only problems with single-digit sums were presented. During phase C of the project, single-digit problems with sums less than 19 were presented. During phase D the problems were composed of one single-digit addend and one double-digit addend, with sums less than 100 and no carrying. During phase E two double-digit addend problems were presented, where the sums were less than 100 and no carrying was required. In phase F, 2 triple-digit addend problems were presented where the sums were less than 1000 and no carrying was required. In phase G, 3 single-digit addends were programmed. The sums of these columns were less than 28. Finally, in phase A all the combinations of mathematics problems were given again. The data from this project revealed that the boy's correct rate was now about 8 correct responses per minute and his error rate was zero. The results are shown in Figure 27.

Project 4

This program for a second-grade boy required placing flash cards of capital letters in sequential order (see Figure 28). Throughout the initial 5 days when the teacher gave the student a set of cards and requested that he sequence them, his rate of correct sequencing was about 2 responses per minute and his error rate was about .27. During the second phase of this project a goal line was established, stating that if no errors were committed and the task was completed within three minutes, the boy would be granted three minutes of free time. This project was to run until three consecutive no-error days were established. The next step of the project was to repeat the same procedure with lower case letters. According to the data, 3 consecutive no-error days were established and rate of correct answers rose to a median of 9.8 responses per minute.

Project 5

This project was concerned with a ten-year-old boy in a regular fourth-grade class (see Figure 29). Throughout the first 5 days the teacher presented multiplication problems of 3 classes--10 with no carrying, 10 carrying one digit and 10 carrying two digits. Throughout the first phase, when no cues or instructions were given other than to complete the problems, his rate of correct answers was about .5 per minute and rate of errors 1 per minute. During phase B, 30 problems were again programmed but the subject was told that during this phase there would be no carrying The boy's correct rate during phase B was about 4 responses per minute. Meanwhile, his error rate declined to about .1 errors per minute. During phase C he was presented 30 problems which involved carrying in the tens column only. A cue was added in that a line was written over the tens column. After the third day of this phase the cue was removed. The data revealed that throughout phase C the correct rate was about 3 responses per minute, while the error rate was about .2 per minute. During phase D the boy was required to carry in both the 10's and 100's columns and was provided cues by lines written above both the 10's and 100's columns. He was also instructed that these problems involved carrying in two places. Again as in the preceding phases, 30 problems were presented to the boy each day. The boy's rate of correct answers throughout this phase was about 3 problems per minute; his error rate was about .09 per minute. During a final phase, A′, the same problems presented during phase A were given again--10 problems with no carrying, 10 problems with carrying in the ten's place, and 10 problems with carrying in the ten's and hundred's columns. For 5 days data were again kept on his rate of answering problems of these classes. The data revealed that his correct rate was about 3 responses per minute, while his error rate was zero.

Project 6

This project was concerned with the subtraction skills of a seven-year-old boy in a regular second-grade class. The teacher had observed that the child would not bring down the digit in the ten's column. For example, if requested to subtract 3 from 14, his answer would be 1. During the five-day observation phase, the boy was presented each day 25 subtraction problems containing two-digit minuends and one-digit subtrahends, but requiring no borrowing. The teacher provided no instructions to the boy other than asking him to complete the problem. As shown in Figure 30, the data from this phase revealed that the boy's correct rate was about .6 per minute and his error rate about 1 per minute. Throughout a five-day period, phase B, the same type problems were presented. Now, however, visual cues were provided--dashes placed beneath the unit's and ten's columns. Beneath the first dash was the numeral 1 and beneath the second dash was the numeral 2, to indicate the steps for completing such a problem. During this phase the boy's correct rate rose to a median of 2 responses per minute and his errors fell to a median of .5 per minute. A second modification phase was then instituted. The subject was again given 25 problems each day of the same class, 14 - 3, but throughout this phase the numeral 2 underneath the dash in the ten's column was no longer provided. During this phase the boy's correct rate rose to a median of 2.3 answers per minute, while his error rate was .18 per minute. During phase D the same skill was requested of the boy each day, but the numeral 1 beneath the dash in the unit's column was also removed. The data revealed that the boy's rate of answering correctly rose to a median of 4 problems per minute while his median rate of errors was zero per minute. Finally, during the last phase, phase A′, the conditions were as they had been throughout the initial phase. The boy was once again required to answer problems of the class 14 - 3, but no cues or instructions were provided. His median correct rate was 5 answers per minute and his median error rate zero per minute during the final phase.

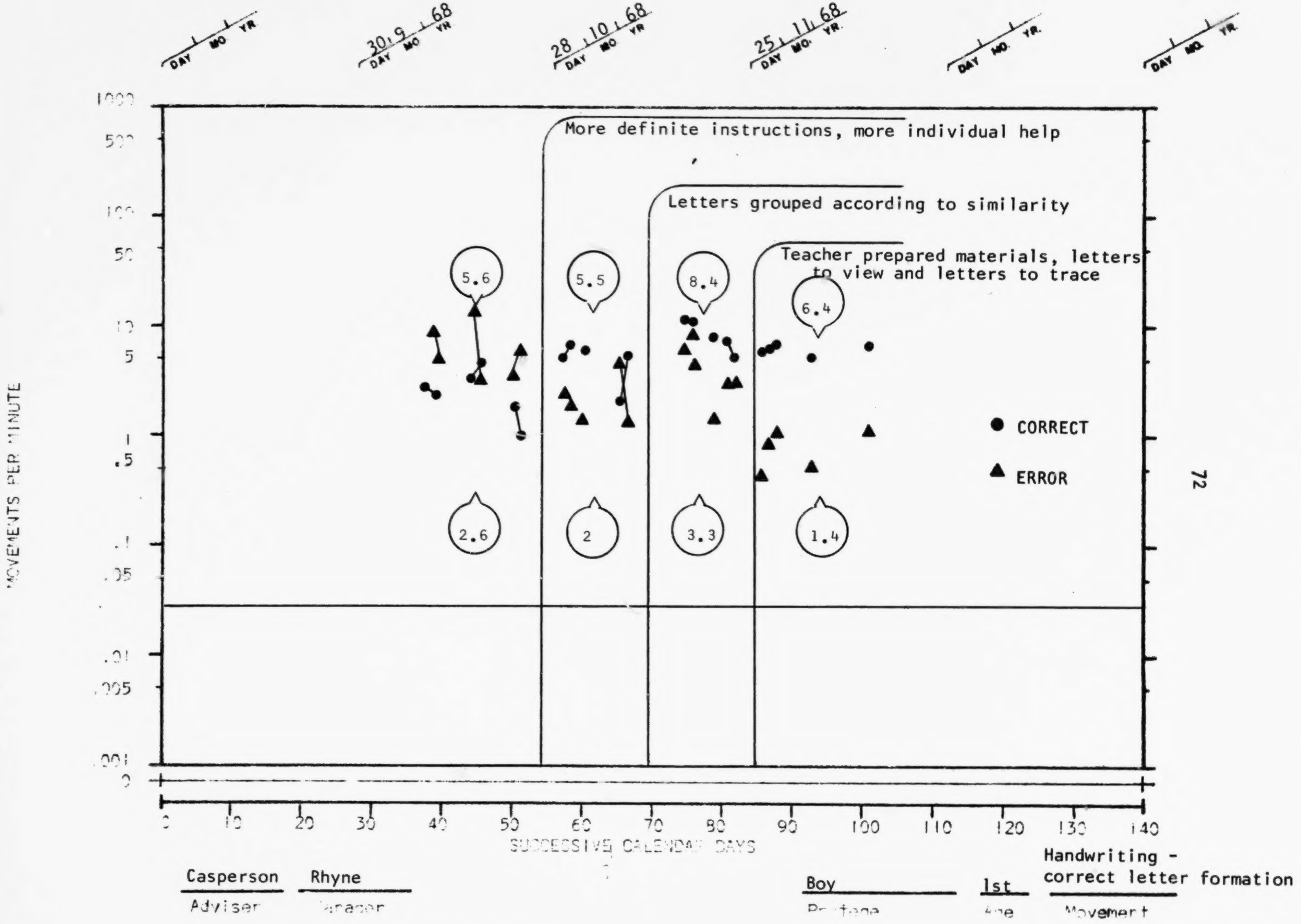

Figure 25. Acceleration of handwriting.

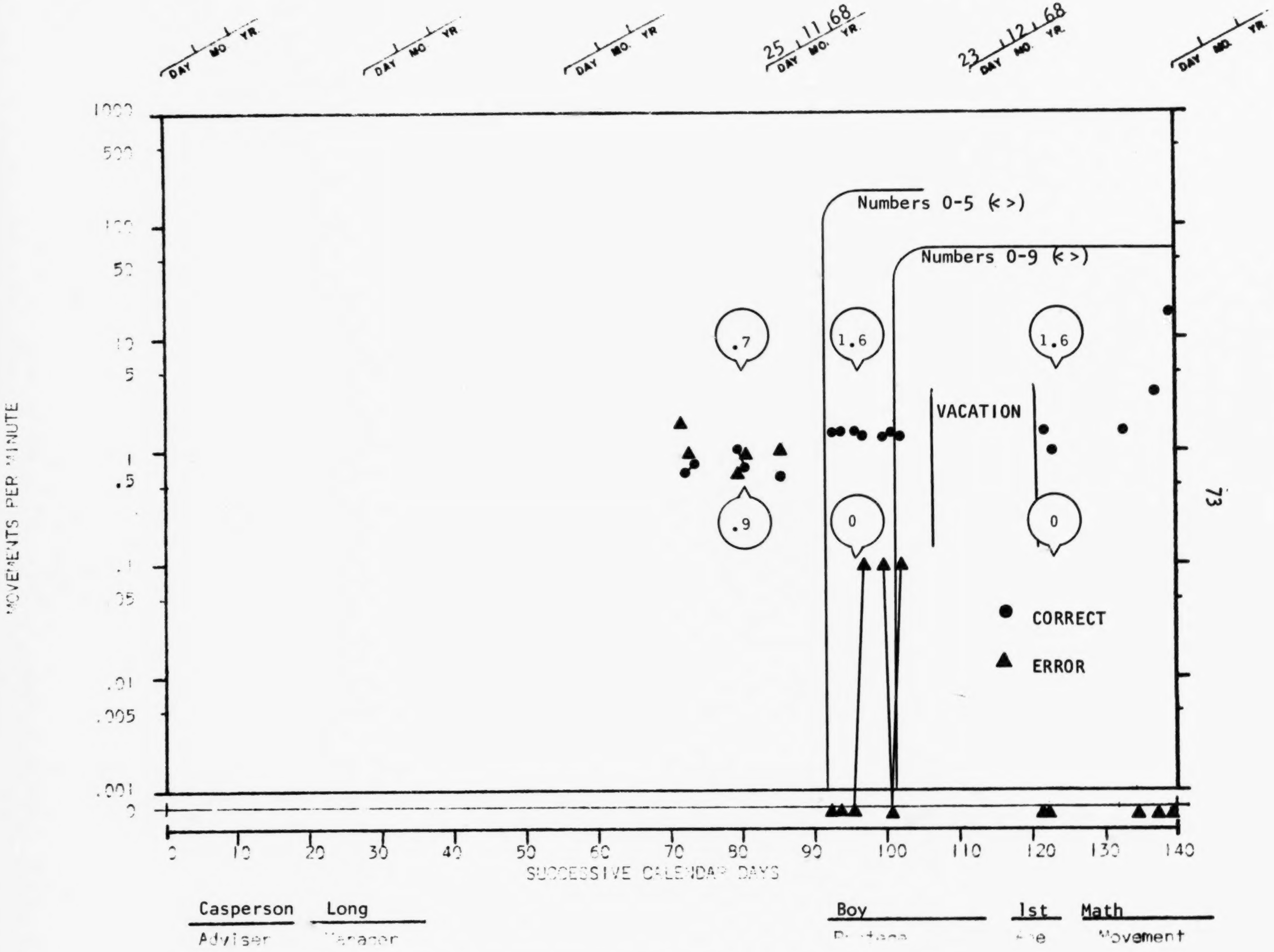

Figure 26. Acceleration of correct usage of the symbols for "greater than" and "less than."

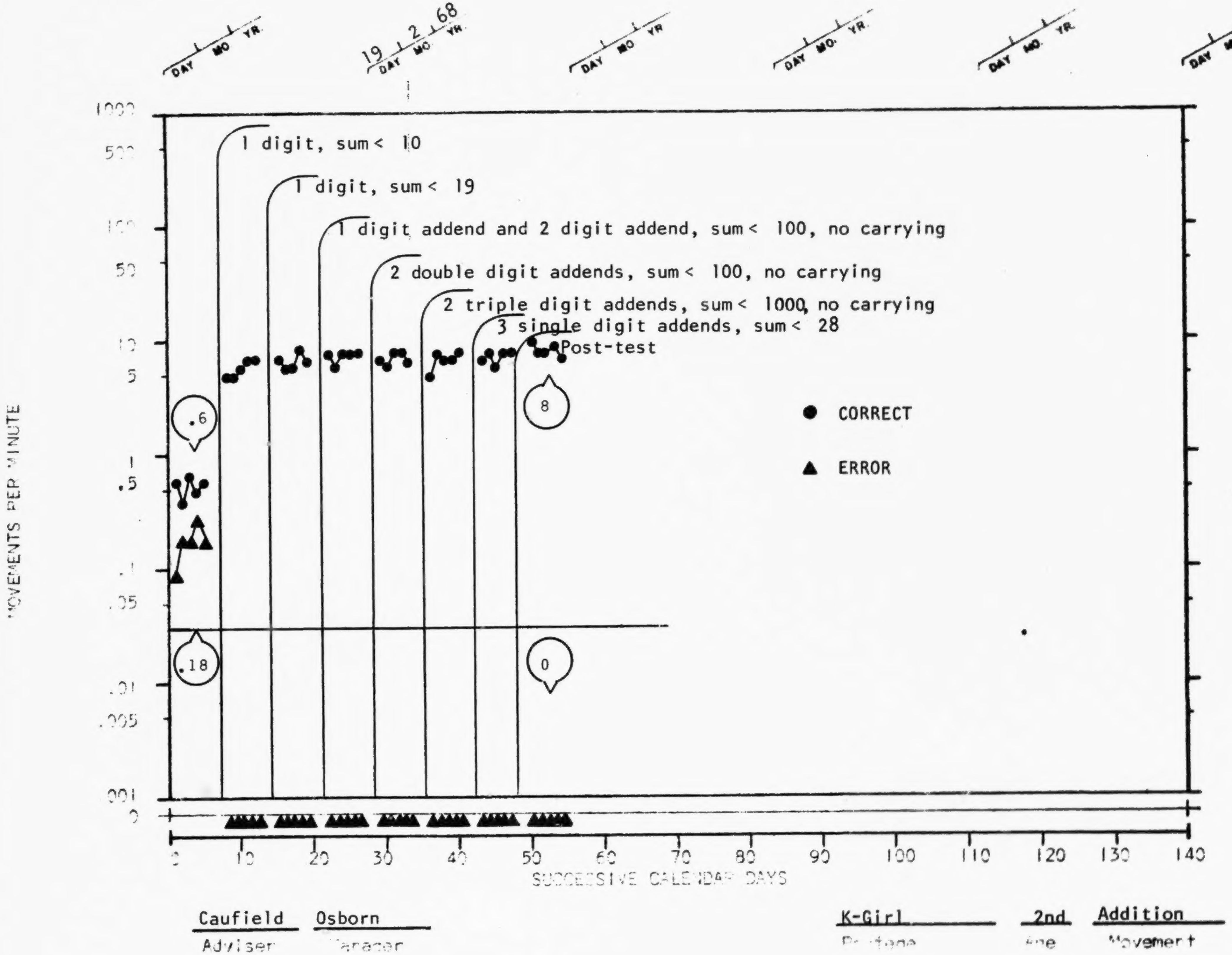

Figure 27. Acceleration of addition skills.

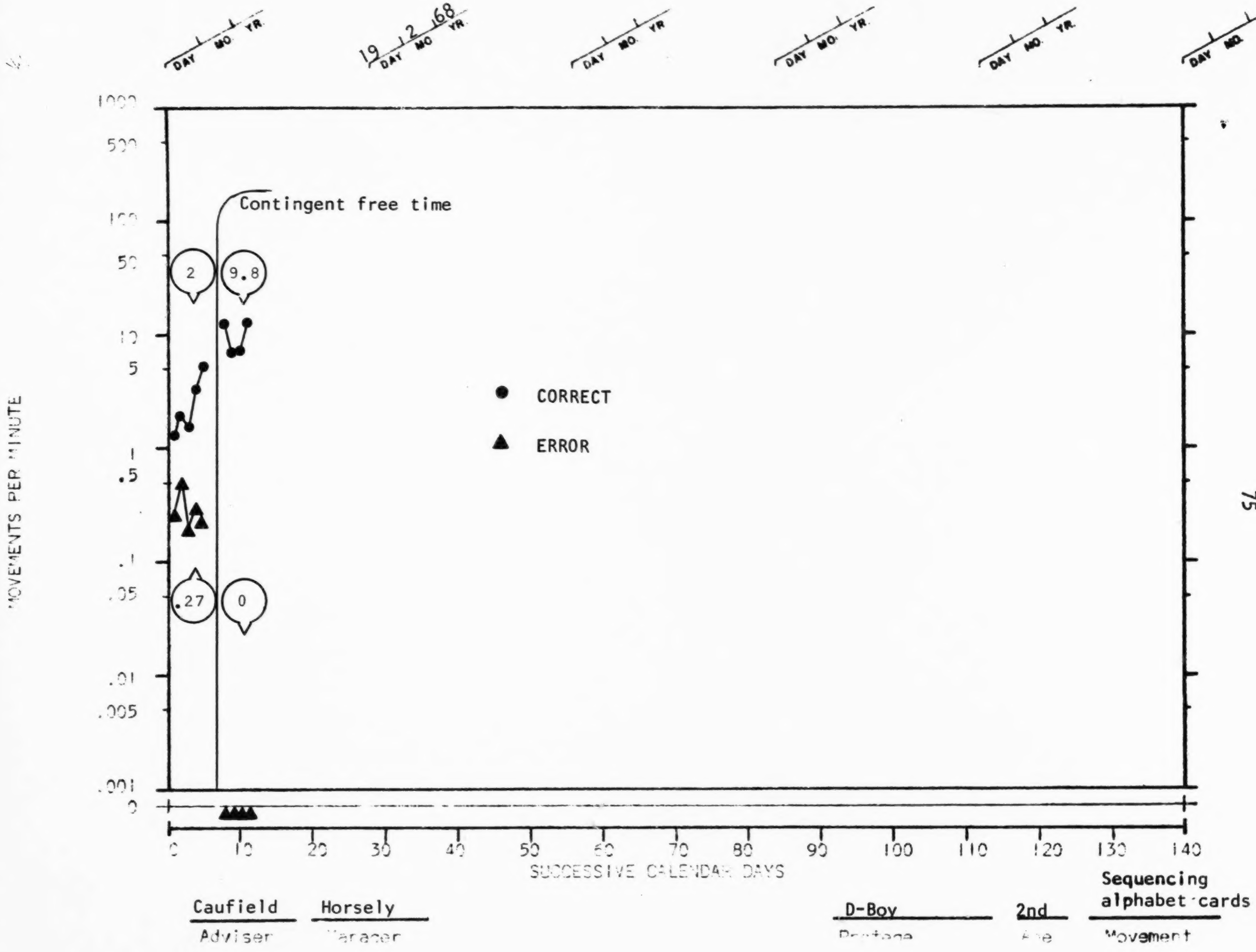

Figure 28. Acceleration of sequencing alphabet cards.

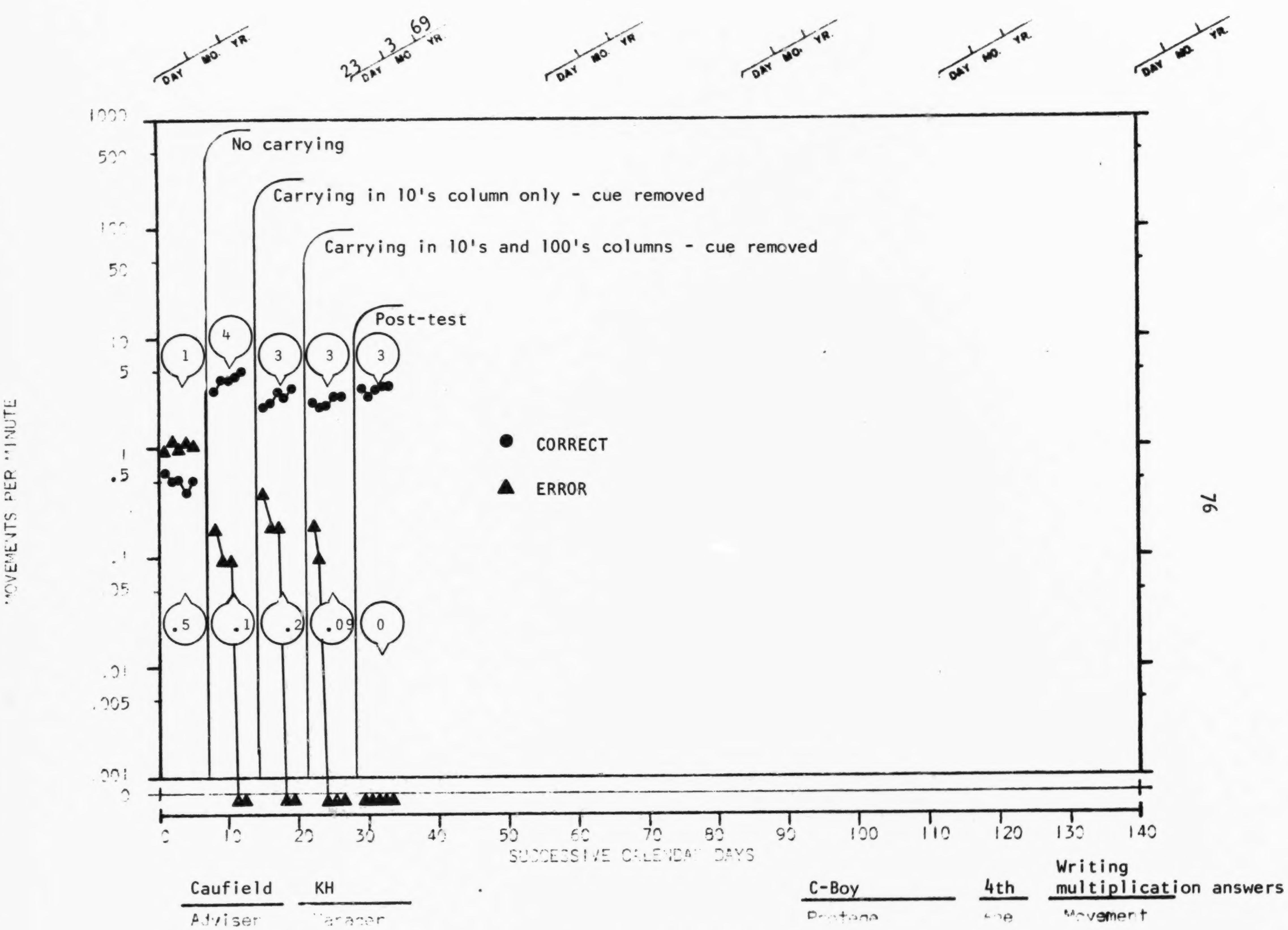

Figure 29. Acceleration of writing answers to multiplication problems.

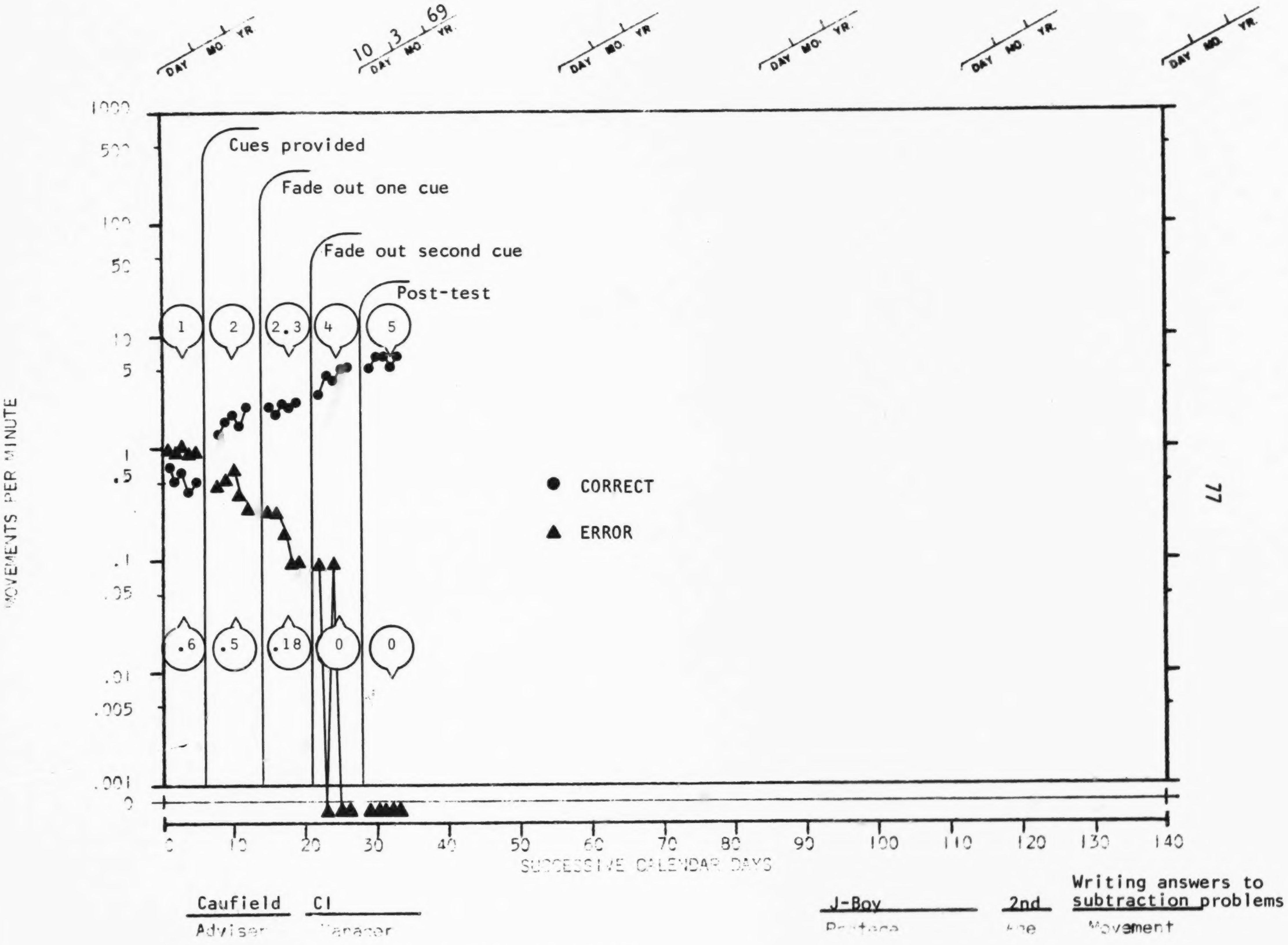

Figure 30. Acceleration of subtraction skills.

Group Measurements

Project 1

The purpose of this study was to demonstrate the effects of individualized instruction with 12 fourth-grade students. As shown in Figure 31, 10 days of baseline data were taken from the regular math book, during which time all students were given the same assignment. Correct rates for this phase ranged from zero to 1.5. During the 10-day second phase the Sullivan Programmed Math Book 4 was used and students were taught to self-check and self-record their responses. Furthermore, the students were allowed to work at their own rate, although a minimum requirement of 25 correct problems during the 30-minute work period was established. The material covered in this book was similar to that in the regular text, but the pupils had many more opportunities to respond. During the second phase the correct rate ranges were from .8 to .5. A third phase was instituted during which time the students were moved back into their regular textbooks at the point they were when phase 1 of the project ended. The minimum requirement of 25 correct problems during the 30-minute work period was still in effect. The difference between this and the final phase was that now the students could progress at their own rate. The data from this phase indicated correct ranges from .8 to 3.3, similar to those in phase 2.

Project 2

This project involved four students in a regular second-grade class working in Laidlaw math workbooks. Throughout this project the students were required to complete 2 pages of mathematics to earn free time. During the five-day phase 1, data were obtained for 20 minutes as the children advanced through their regular text on non-sequenced material. The data revealed that the median correct rates of the children were about .6 and the median error rates about .3.

During phase 2 the Laidlaw material was revised by placing similar types of addition problems together. During phase 2 the median correct rate rose to about 1 per minute as the median error rate fell to about .05 per minute. The results of this project are shown in Figure 32.

Project 3

This group project was conducted with 9 second-grade pupils responding to Sullivan Reading materials, with major emphasis on teaching the children self-managerial procedures. Throughout the course of their 21-week stay in a demonstration class, the first portion of this study, the children were taught to record the time their regular program began and the time that it ended, and to find the total time of the program. They were also taught to count their correct answers and errors each day, to use a rate plotter to calculate correct and error rates, and to graph these rates on 6 cycle log paper. They were then taught to evaluate their performance--to tell the teacher whether their correct and error rates had gone up or down. Not only were correct and error rate data maintained daily, but the percentage of words learned was tabulated each time a new book was completed. For example, before a child entered Sullivan Book 1 he was given a pre-test on the new words and when he had finished the book he was given a post-test. If his competency was less than 80 percent on Book 1 words he was required to work in Book 1 again. If his performance was at 80 percent or greater, he was advanced to Book 2. This procedure of testing the new words in each book prior to entering a higher level book was followed throughout the course of the study. Correct rates during this period ranged from .33 responses per minute to as high as 4.5 responses per minute. The error rates ranged from zero to .5 responses per minute. The median correct rate near the completion of the first phase was about 2.3 correct responses per minute.

During the second phase the 9 second-graders were returned to their regular classrooms. While there, daily correct and error rates continued to be gathered. During this three-week period, without contingencies, their correct rate median was about 3 responses per minute--somewhat higher than in the demonstration class. Their error rates in this phase remained about as they had been.

The third phase was then begun. Although the children remained in their regular classrooms, a contingency was added: if their correct rates were beyond a certain point and if their error rates were below a certain point, they were granted time to play. This phase of the study lasted for 9 weeks or until the end of the school term. The data revealed that the median correct rates remained at about 3 responses per minute. The median error rates decelerated to about .03 responses per minute. Figures 33 and 34 show group data from this project, while Figure 35 presents data for one member of the class.

Project 4

This project was conducted by a sixth-grade teacher who gathered data as the children worked on fractions. The materials in the Laidlaw math series were re-grouped; the add fractions were placed together, subtract fractions together, etc. On Mondays the class worked on addition; on Tuesday, subtraction; on Wednesday, division; on Thursday, multiplication; and Friday, on review work. As one page of addition fractions was completed the pupil took his paper to a correction table, corrected his work, and began on the next assigned page of adding fractions. This process was followed throughout the project. No modification was attempted in this study; it simply involved measurement of each of the four arithmetic processes (see Figure 36). Teacher conferences and program revisions such as assigning supplementary materials were noted on the pupils' charts.

Project 5

In the first phase of this project, a class of first graders individually charted their correct and error rates while working on addition facts 1-9. Whenever a child achieved a correct rate of 20 per minute, he became a member of the "20 Club" and his name was posted on the board. Throughout the second phase the children did subtraction facts, 1-9. The same privilege, becoming members of the "20 Club," was granted when the children reached 20 responses per minute. The third phase of the project involved addition facts 1-10 and the final phase addition facts 1-15. Becoming a member of the 20 or 30 Club was the privilege for good performance. Data from this project are given in Figure 37.

Project 6

In this project a first-grade teacher advanced her pupils through various math problems at individual rates. In other words, although all of the students began on add-subtract facts with the numerals 0-5, some progressed more quickly than others depending on their rate of correct responding. For example, some students whose rates were about 7 responses per minute on the 0-5 addition and subtraction problems were given only addition facts 0-5, while pupils who began on addition and subtraction facts 0-5 and whose rates were around 15 per minute were advanced to addition facts of 0-10. This procedure, promoting some students to more complex problems than others, was practiced throughout the project. Some children in the class were taught to self-graph, while others were taught to check their own correct answers and errors and to plot their data on a rate sheet. Figures 38 and 39 provide representative data from this project.

Project 7

The children in this project were 11 low-achieving fourth and fifth-grade students, selected on the basis of teacher recommendation and achievement test scores (see Figure 40). Baseline data were taken for 12 days on 45 minute sessions using Sullivan Programmed Reading Skills. The first changes were arranging the seating, stapling shut the answers columns, and praising good work. The second change was sending the children back to their classrooms and instructing their teachers to continue gathering data. The results revealed an increase in median correct rates and a decrease in median error rates. When sent back to their own classrooms, correct rates remained the same while error rates increased. Metropolitan Achievement Test results for these children revealed a median increase of 1.2 years between September, 1968 and May, 1969.

Project 8

The children in this project were from 6 1/2 to 9 1/2 years old, a median age of 8.1. At least one child from each second and third-grade class of the school was placed in this remediation class. As shown in Figure 41, baseline data were taken for 11 days as they participated in a daily 45 minute session using the Sullivan Programmed Reading materials. Following this period of initial evaluation, four procedural alterations were instituted. Seating arrangement was changed from rows to a semicircular placement; the answer sheets were covered to discourage looking at the answer before writing it down; the pupils were shown graphs illustrating their correct and error performance rates; and they were asked to evaluate daily their achievement. After these changes were in effect for several days the contingencies were changed. The teacher gave the pupils tokens contingent on such behaviors as attending to the task, raising a hand to request assistance, or checking the answers after a response had been written.

After the five-week token contingency, the tokens were eliminated and the pupils were taught a number of self-management skills. First, the answer column of each page was uncovered and the pupils were taught to correct and record the total number of correct and error responses. Following acquisition of self-recording skills, the pupils were sent back to their respective classes and their receiving teachers were provided a sheet of detailed instructions pertaining to the management of materials for these children. The adviser also visited each receiving teacher to assist in the transition phase. The results of this project revealed that the first changes resulted in a deceleration in both median correct and error rates. The second change, token reinforcement, resulted in an acceleration of the median correct rates, while it slightly decelerated median error rates. The third change (self-management and social reinforcement) resulted in the deceleration of median correct rates and an acceleration in median error rates. Finally, the fourth change (back to the classroom) resulted in a slight deceleration in the median correct rates and a greater deceleration in median error rates.

The Gilmore Oral Reading Test was administered in September when this class was first organized and late in November when the children were returned to their own classrooms. In September the median grade score in reading accuracy was 2.0 while in November the score had climbed to 2.75 years. The median score for reading comprehension rose from 1.6 years in September to 2.2 years in November.

Project 9

This project, conducted in a regular fifth-grade classroom, involved seven students who had difficulty with subtraction. During the first phase of this project baseline data were taken as each child was given a sheet of 100 subtraction facts, including those from $1 - 0 = \square$ to $18 - 9 = \square$, where the remainder was no greater than nine. The teacher corrected and returned the sheets to the students the next day. During the second phase the children were shown charts that illustrated their performance. In the third phase the children could earn free time contingent on meeting both their time and accuracy goals, which were established by the teacher on the basis of each child's previous performance. Free time was accumulated up to a maximum of 5 minutes per day and cashed in on Friday afternoon.

The data revealed that during the first change many children's rates were affected. The data of the two subjects presented here illustrate that the teacher-specified goals affected the pupils' performance. Representative data are provided by Figures 42 and 43.

Project 10

This project took place in a fifth-grade reading class with 15 children designated as 2 to 3 years below grade level on the basis of teacher evaluation and achievement test scores. The 15 children were involved in daily sessions of 45 minutes using SRA reading materials. During the first phase, the children were placed on a certain difficulty level on the basis of an SRA placement test. As the children worked throughout each day, they were required to write their answers in the SRA booklet. After finishing a complete card, a child self-corrected his own work and went to another card at that level. Each morning, following a work session, the record booklets were re-corrected by two other students from another reading group. They also recorded and charted each student's correct and error rates, plus his comprehension percentage.

In the second phase of the project the teacher began showing each child his record and discussed his performance with him. No child went more than two days without a conference. In a final phase of this project a change was made in the seating arrangement; the children were seated in a semi-circle with the teacher stationed at the open end of the circle.

At the end of the nine-week project, the entire group was given a Metropolitan Achievement Test which had also been administered at the beginning of the year. The median class gain was .65 years. Figures 44 and 45 show representative data from this project.

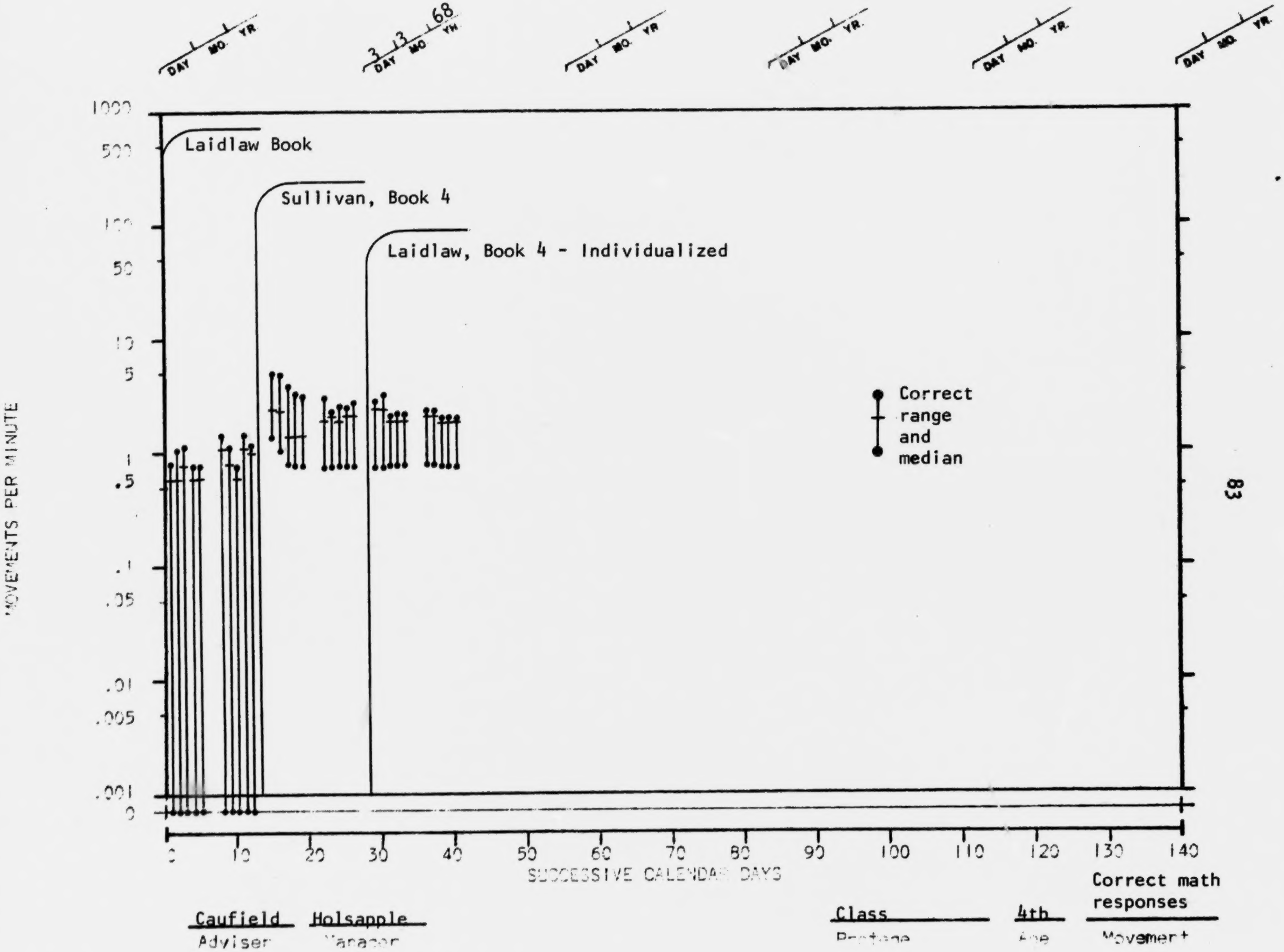

Figure 31. Correct rate ranges and medians for a reading class.

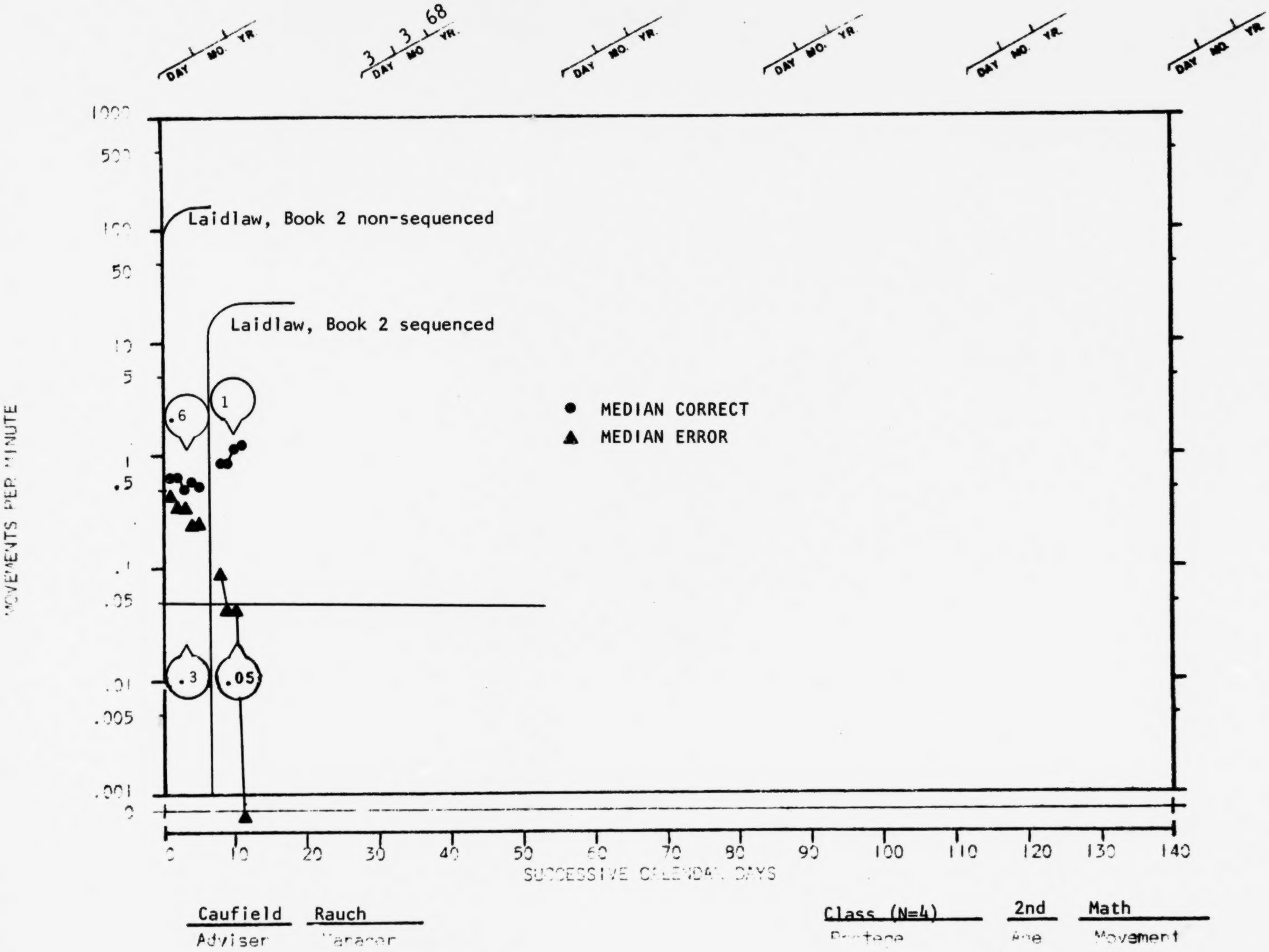

Figure 32. Median error and correct rates for a mathematics group.

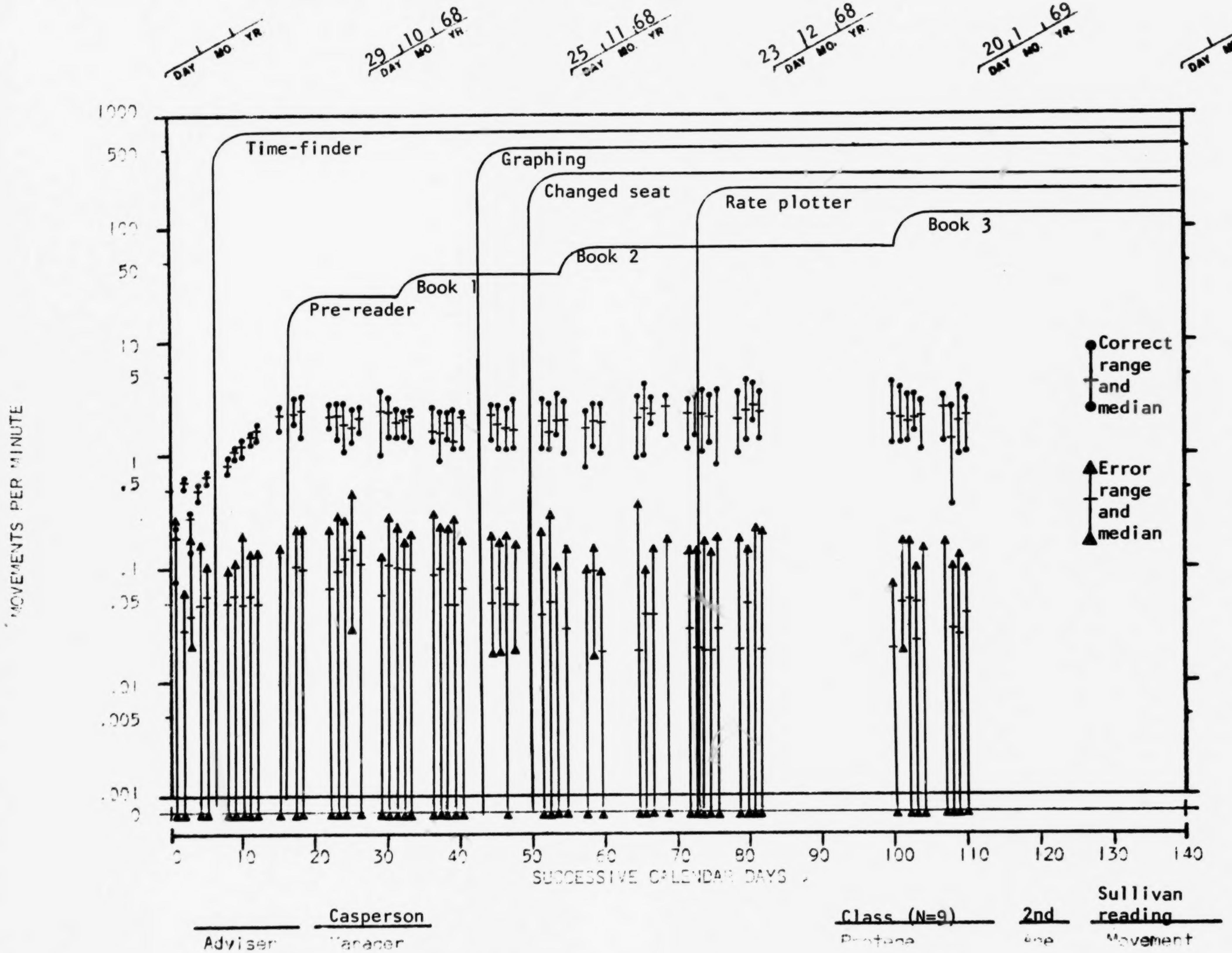

Figure 33. Correct and error rate ranges and medians for a second grade class during first semester.

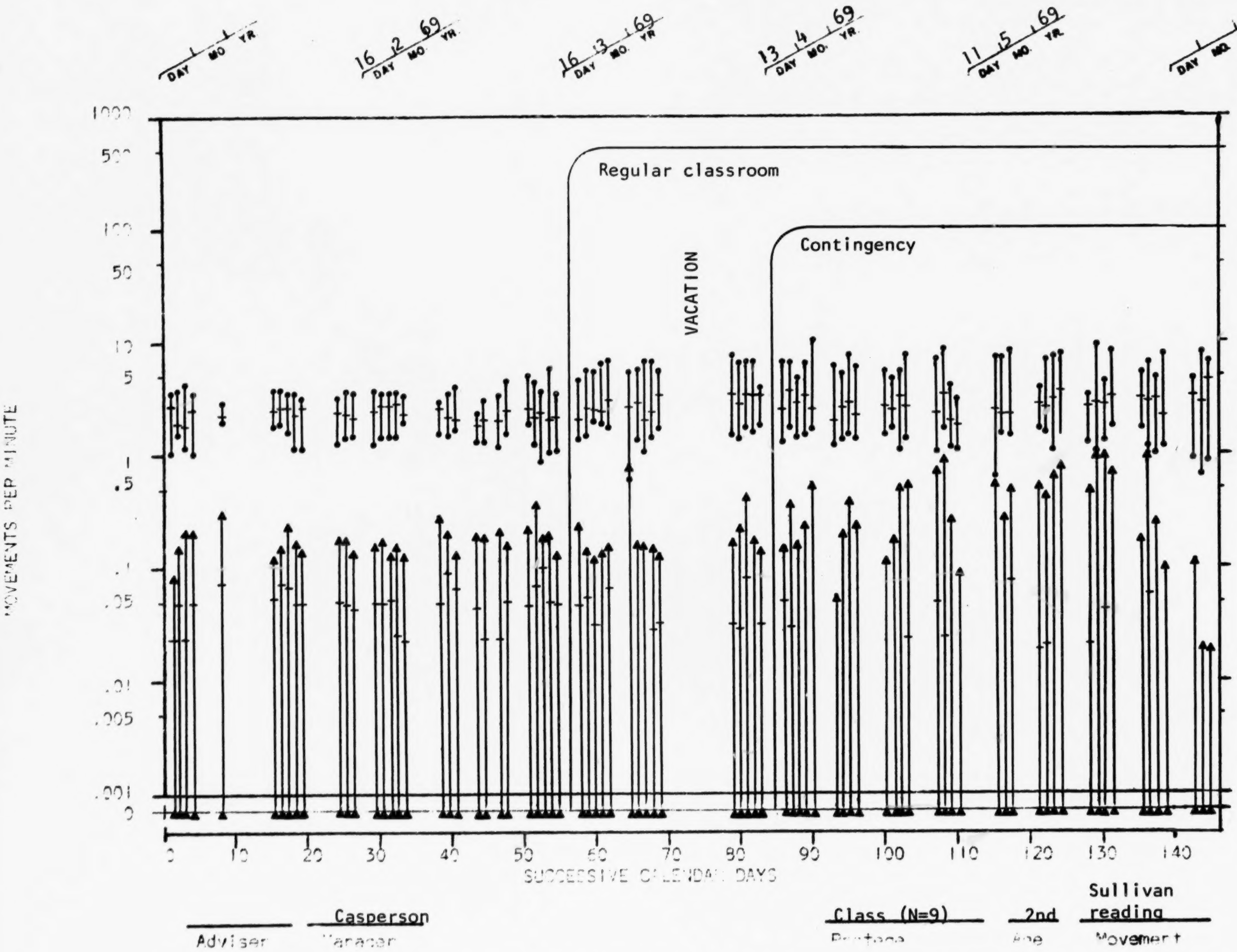

Figure 34. Correct and error rate ranges and medians for a second grade class during second semester.

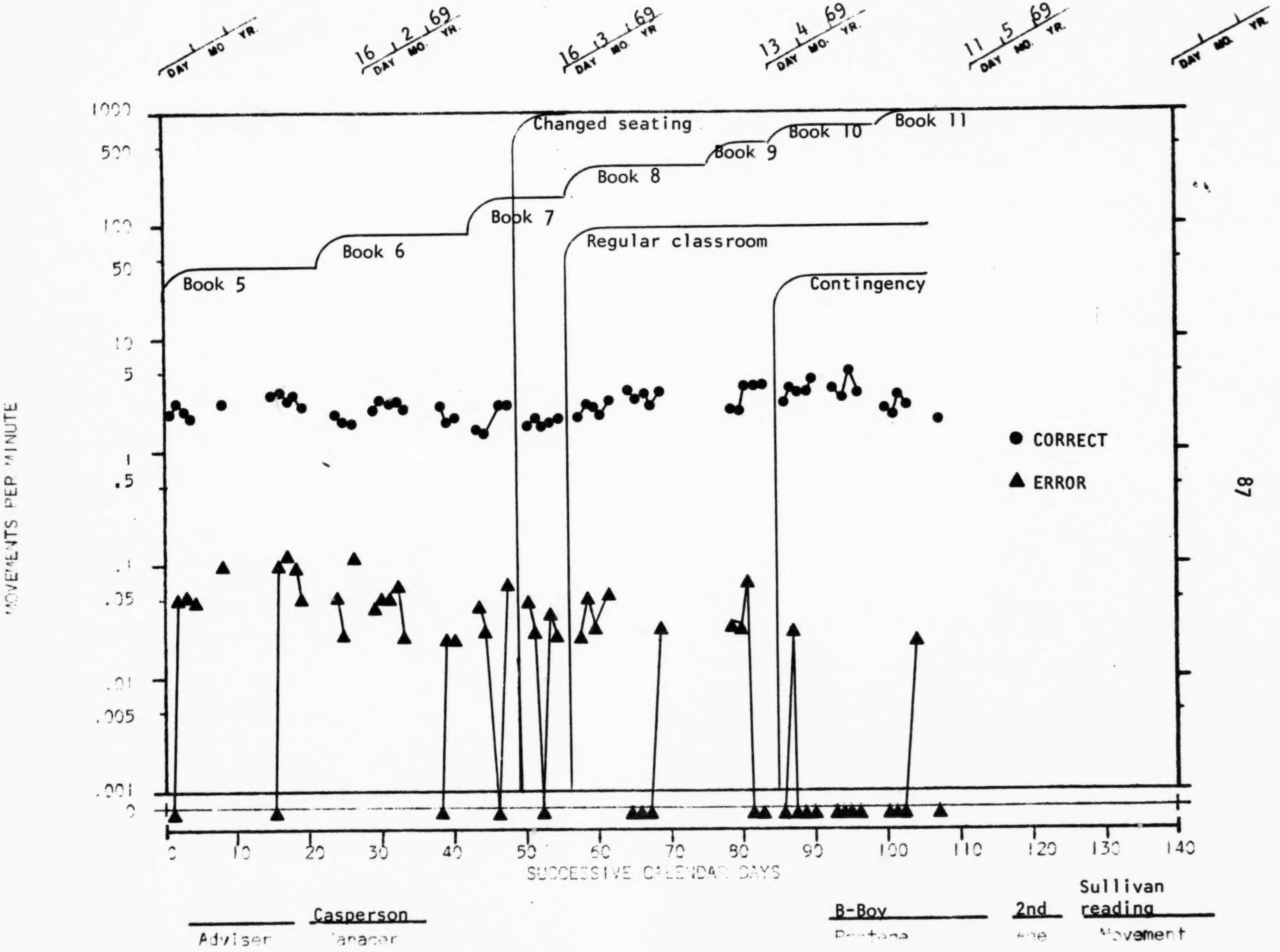

Figure 35. Correct and error rates for a boy from the above second grade class.

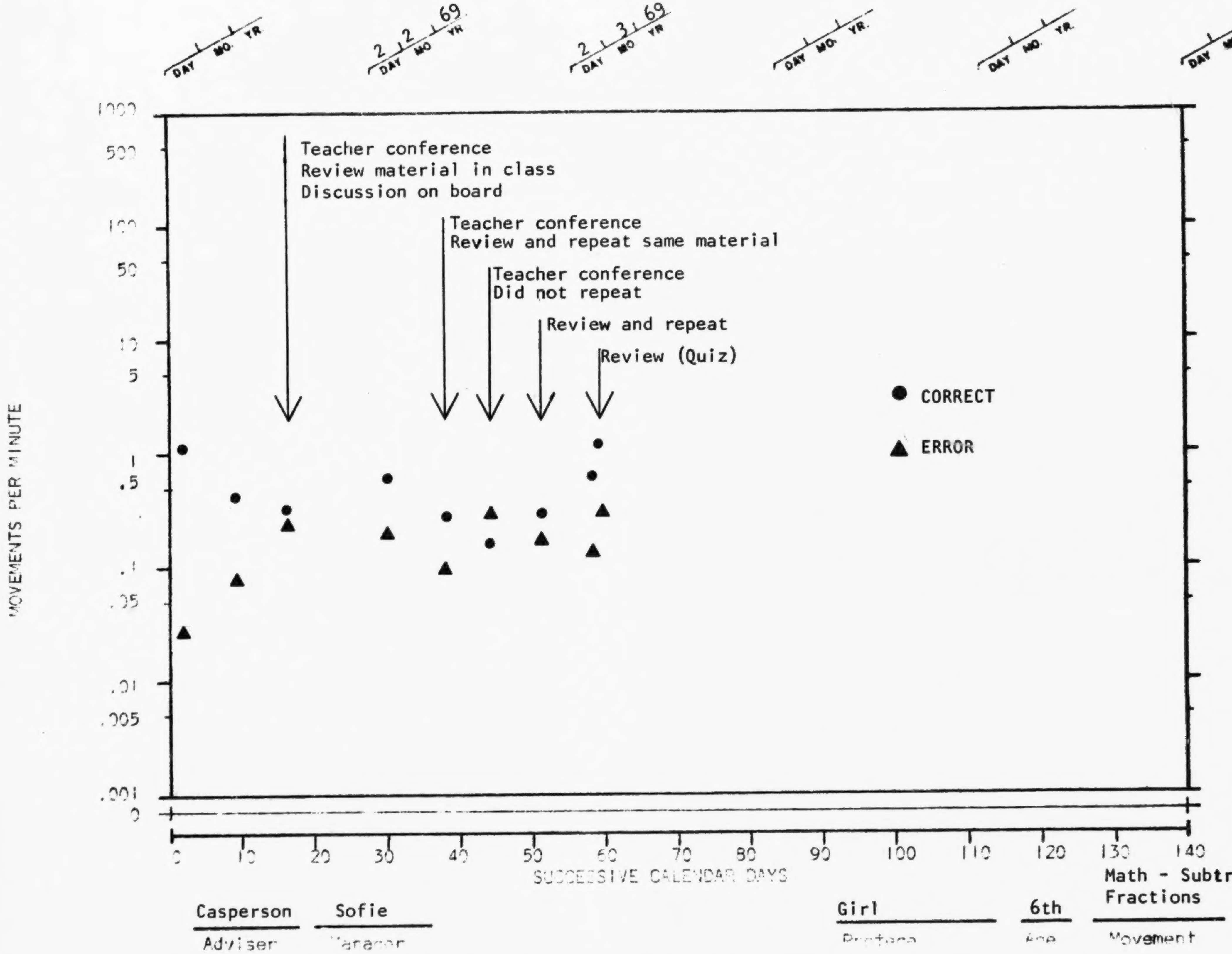

Figure 36. Representative data from one individual in a sixth grade math class.

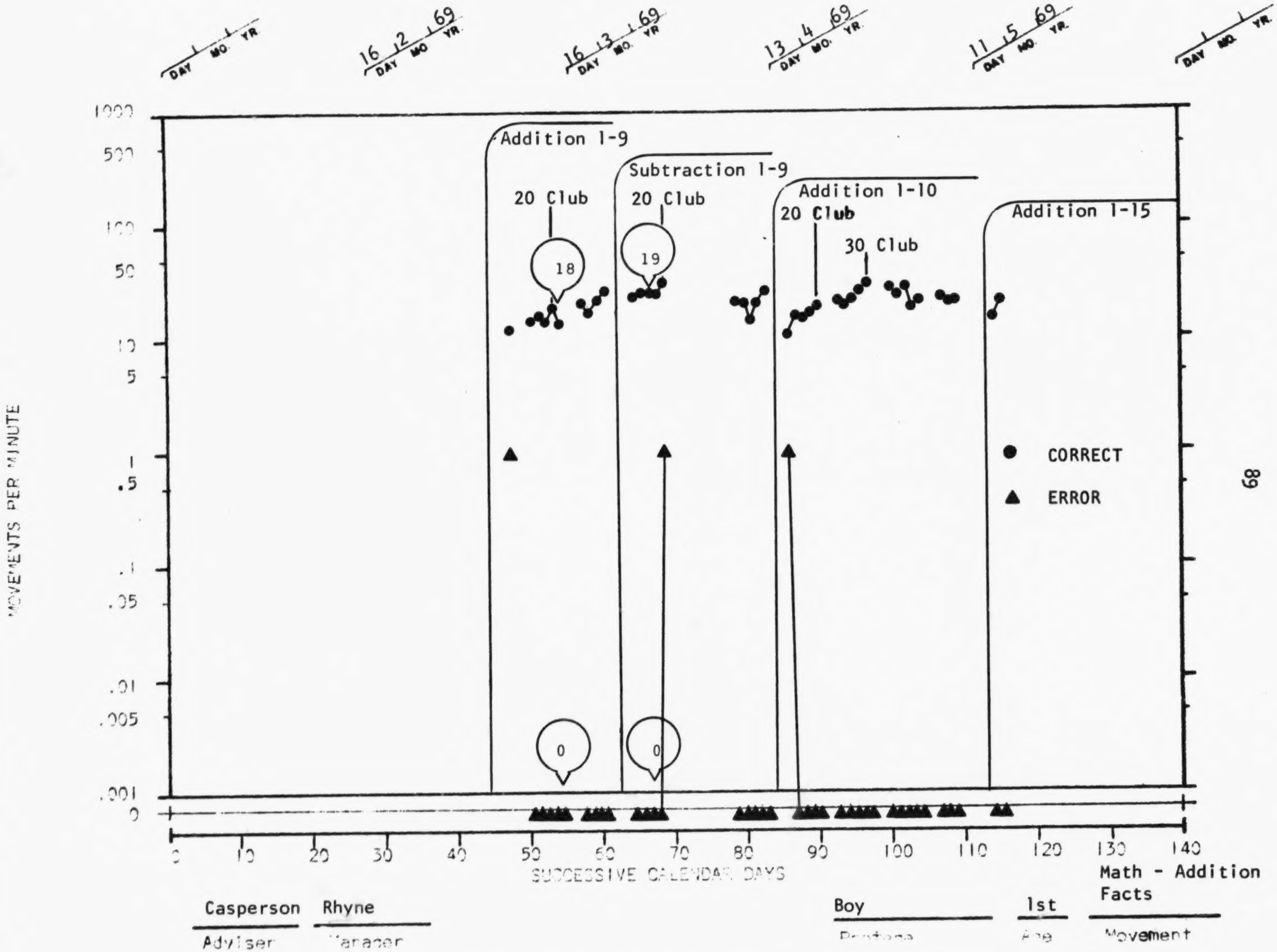

Figure 37. A first grade boy's correct and error rates in addition.

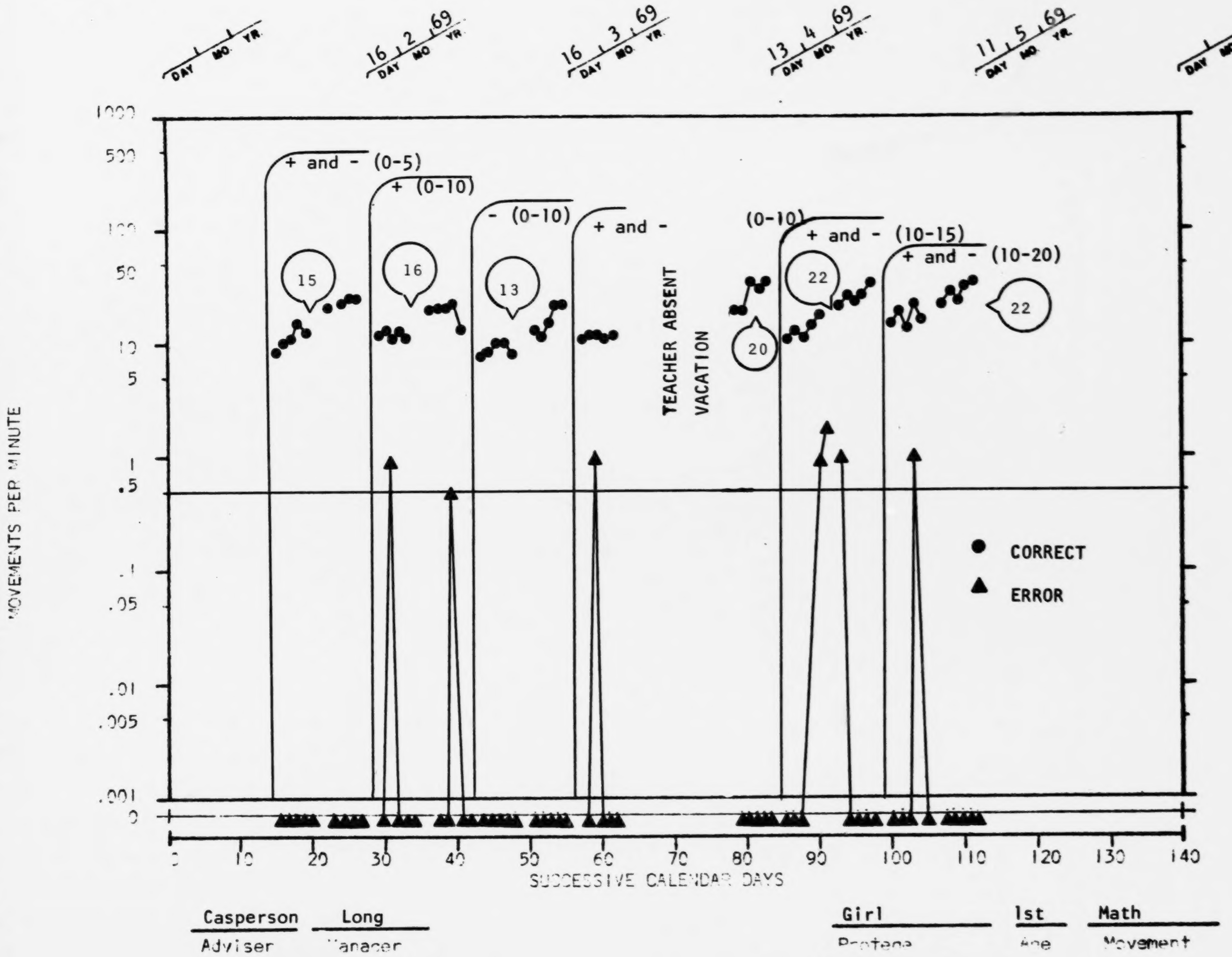

Figure 38. A first grade girl's correct and error rates in addition.

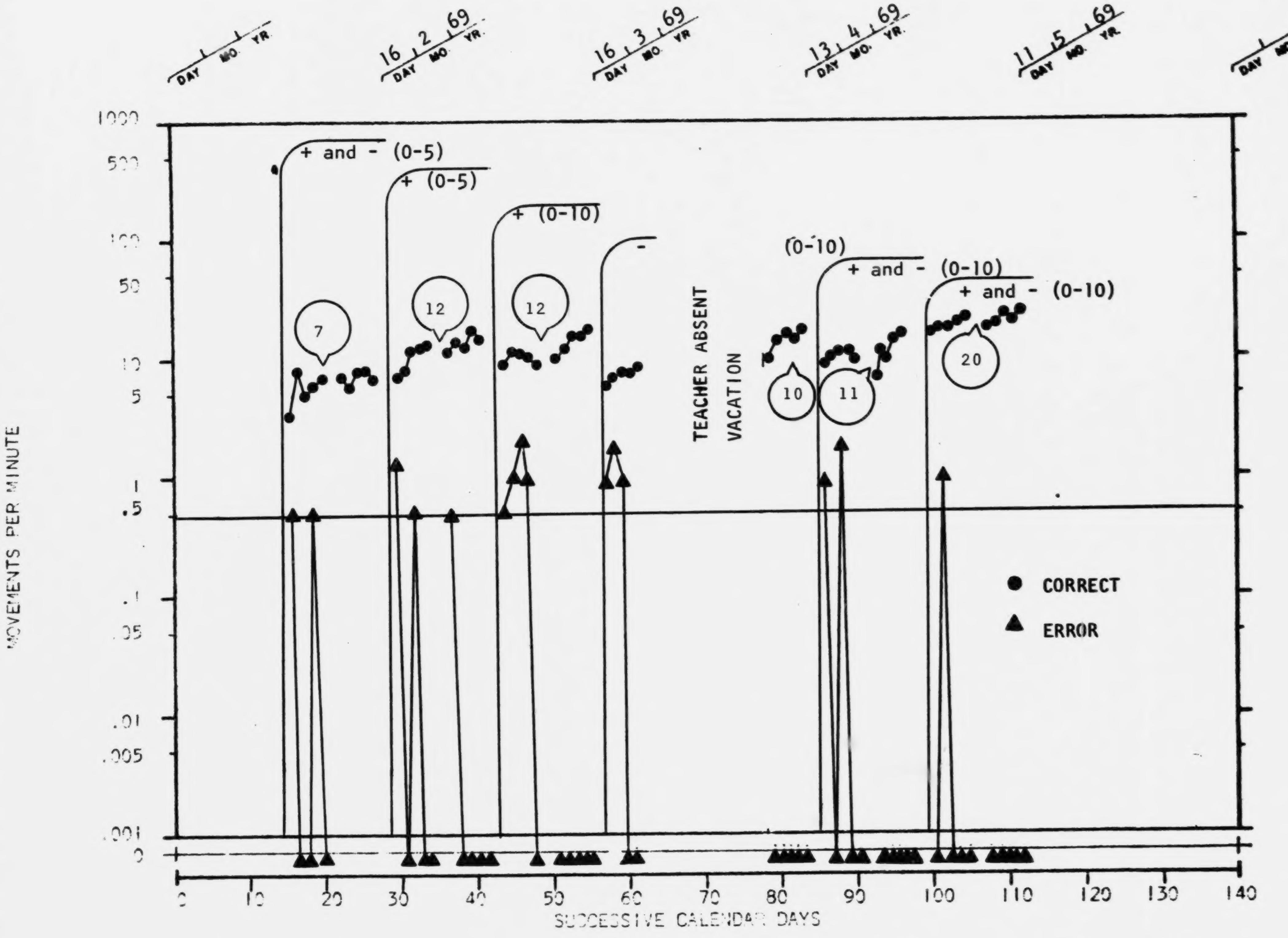

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Figure 39. A first grade girl's correct and error rates in addition.

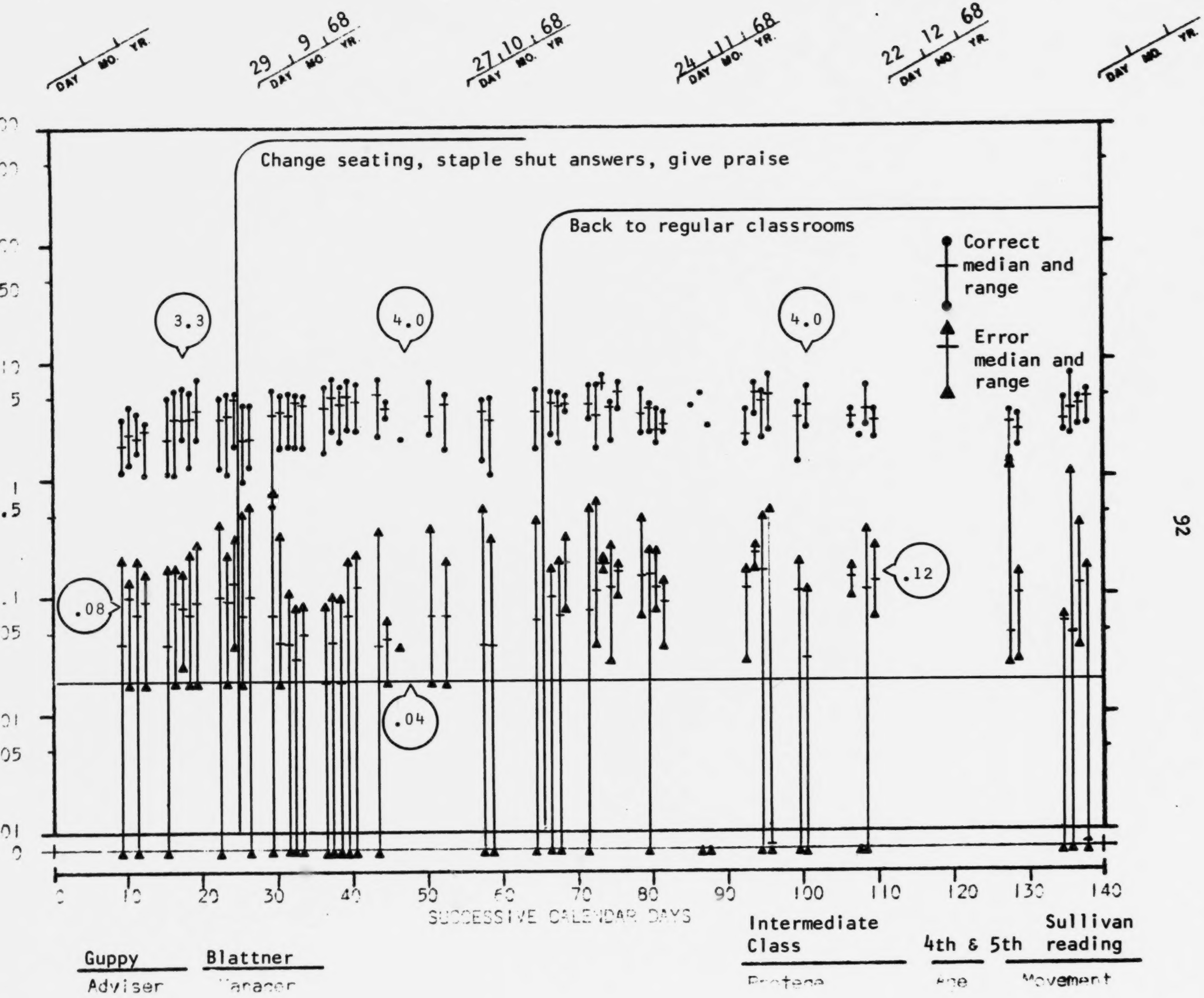

Figure 40. Correct and error rate ranges and medians from an intermediate reading group.

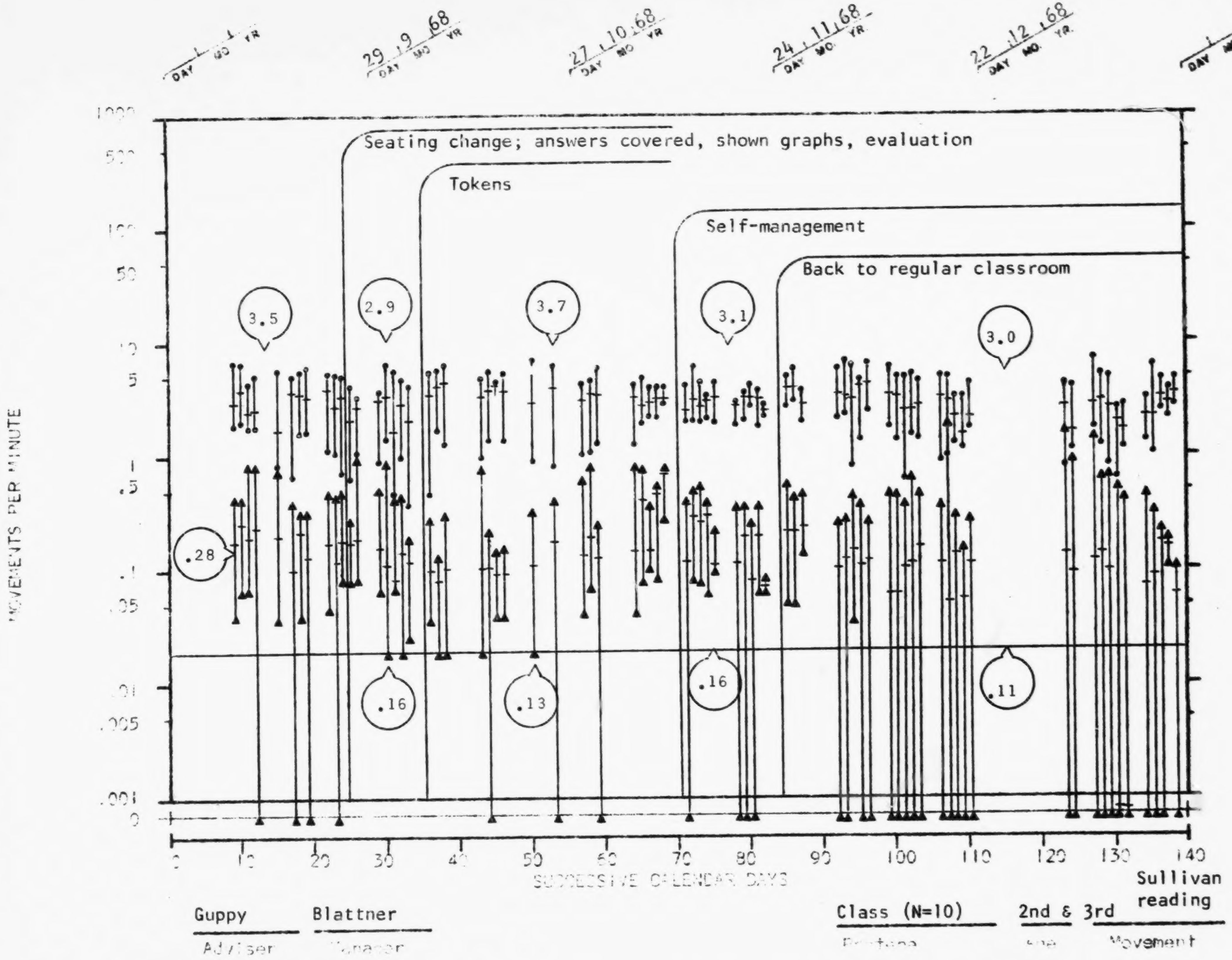

Figure 41. Correct and error rate ranges and medians from a primary reading group.

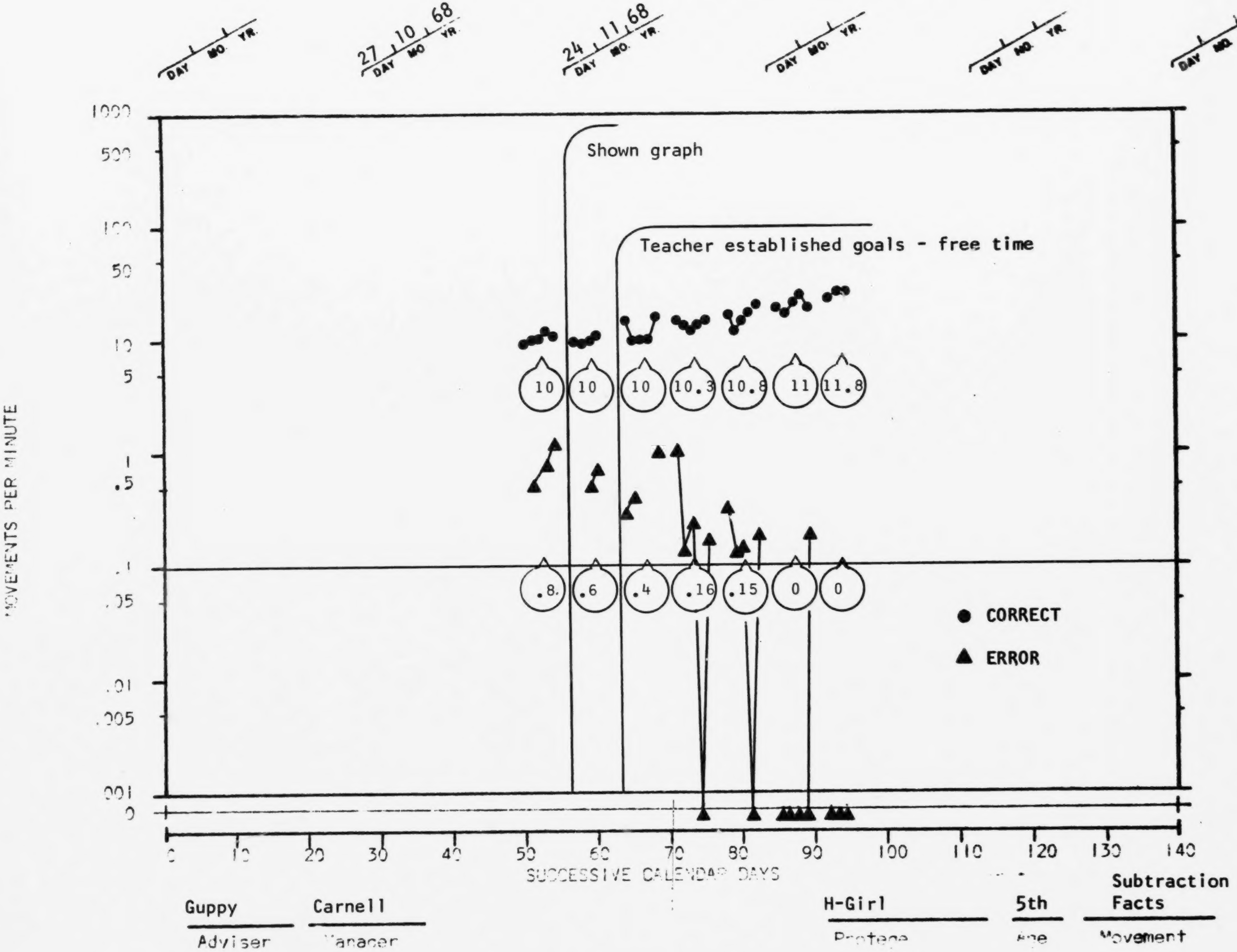

Figure 42. Correct and error rates of a fifth grade girl in subtraction.

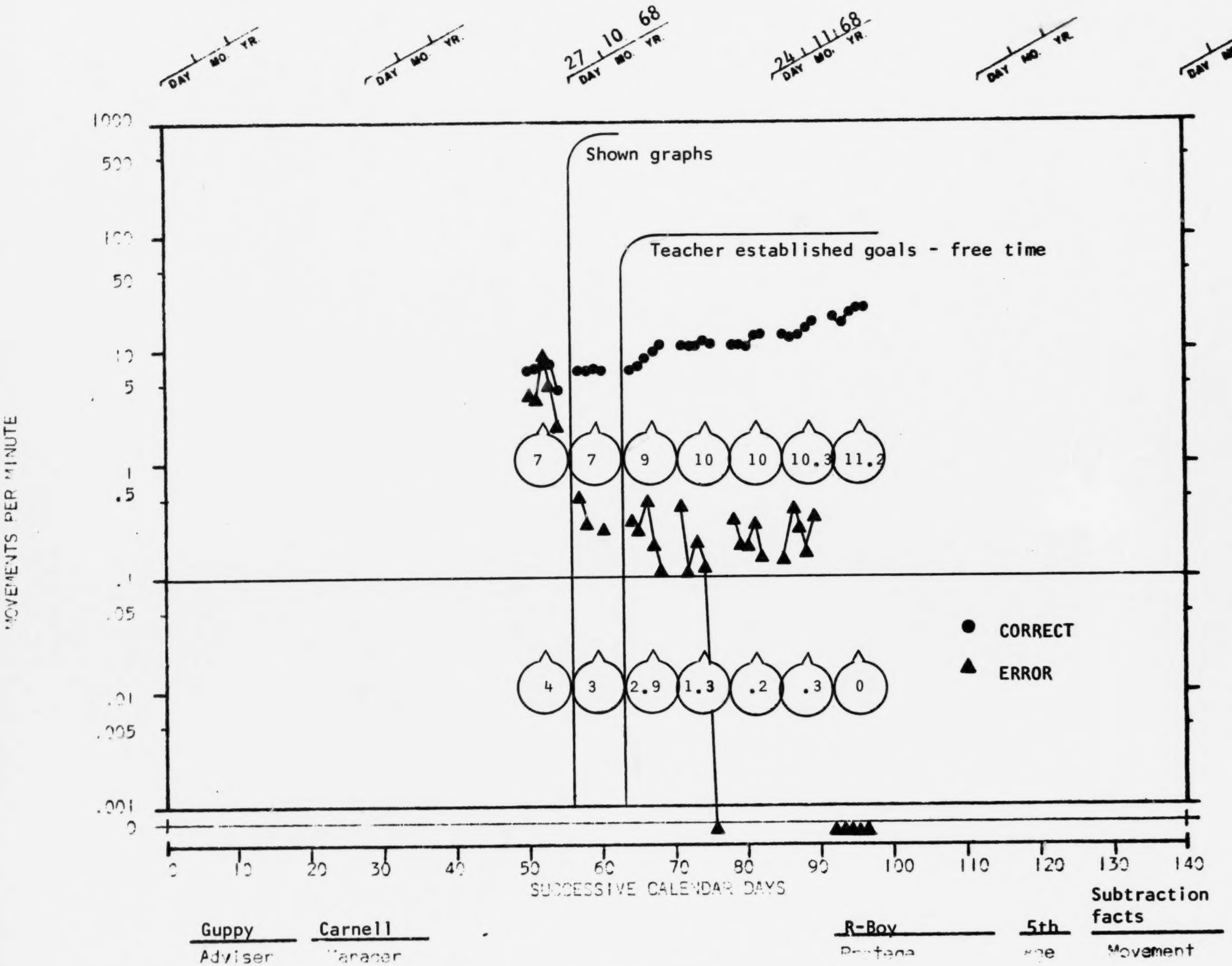

Figure 43. Correct and error rates of a fifth grade boy in subtraction.

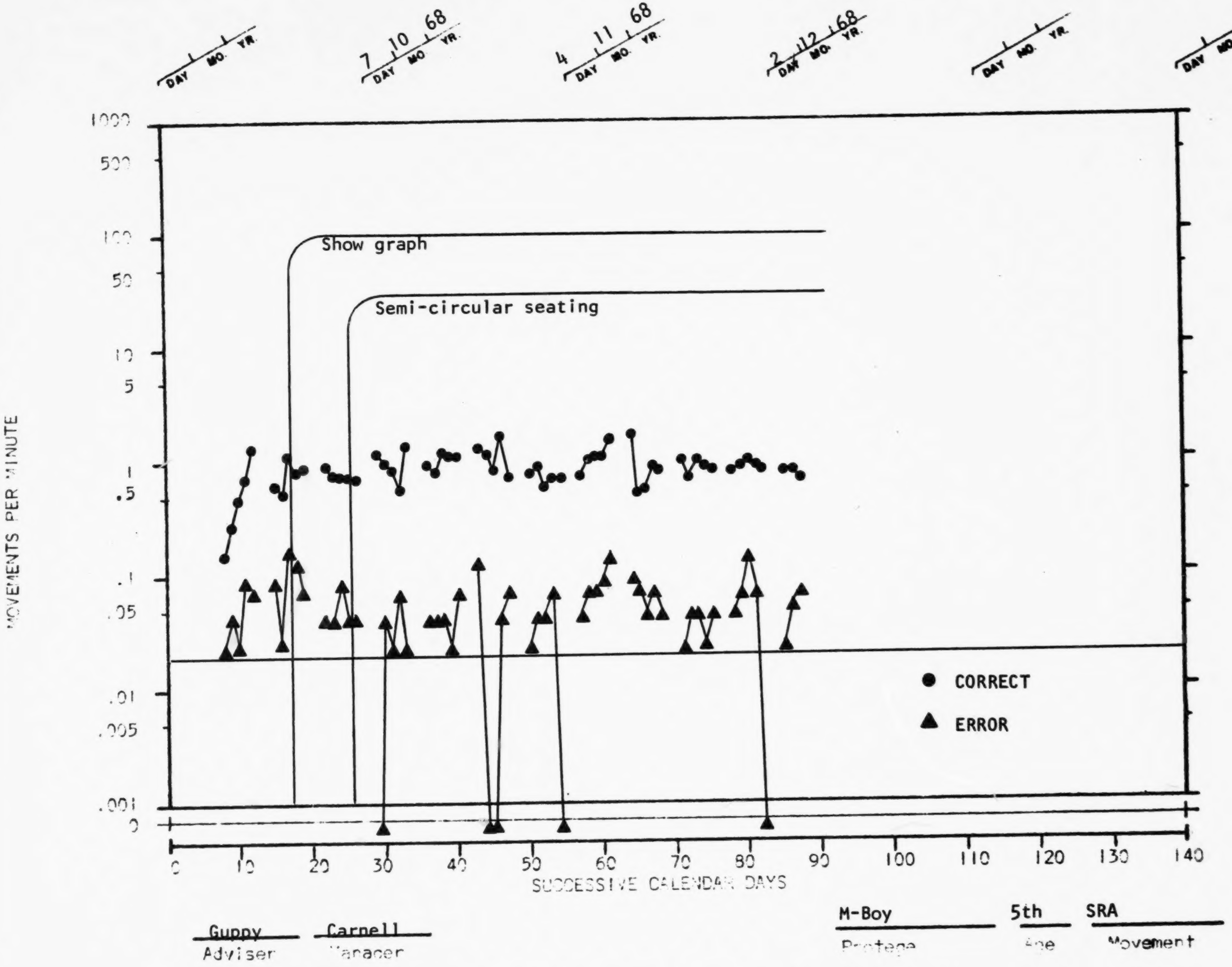

Figure 44. Correct and error rates of a boy in a remedial reading class.

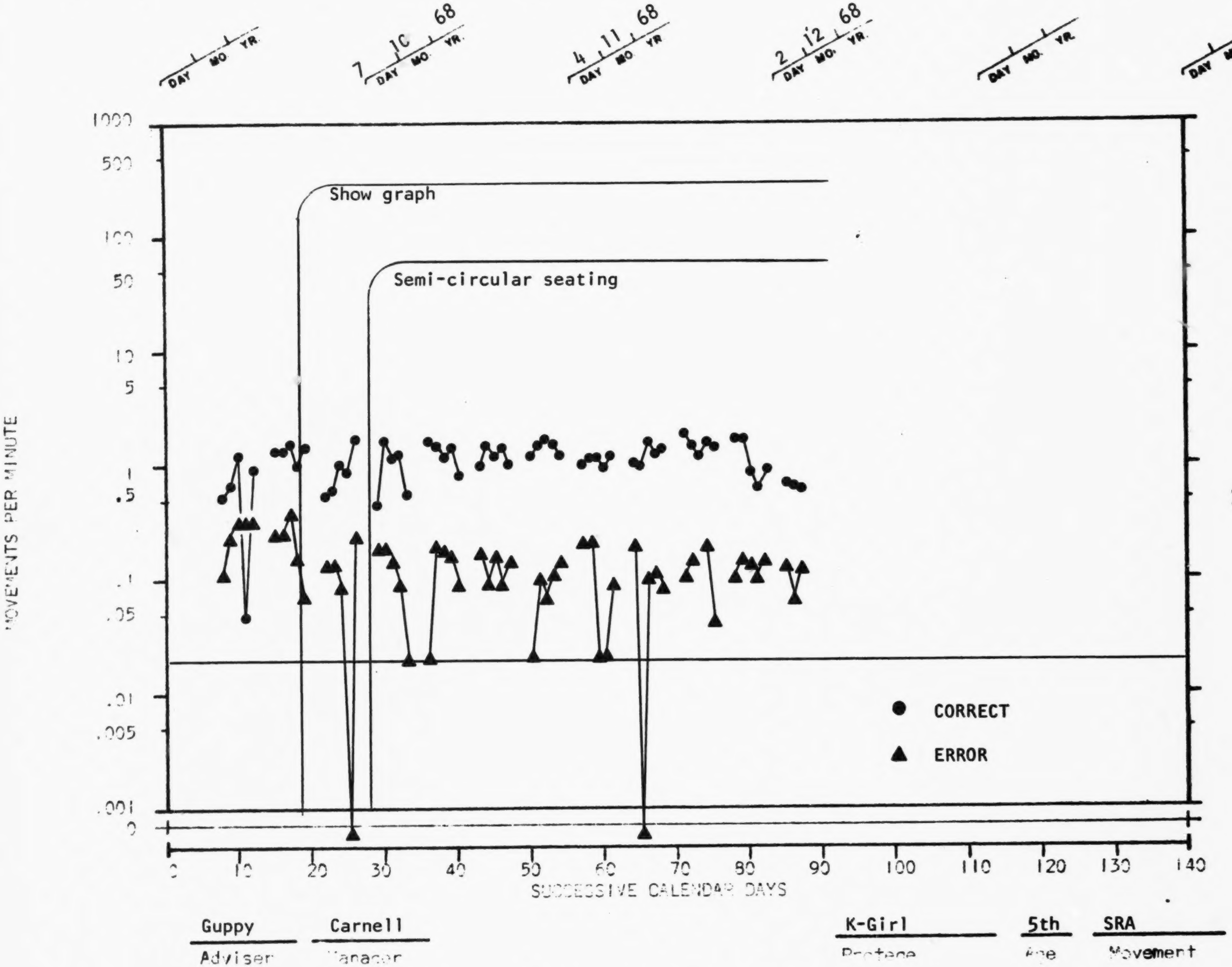

Figure 45. Correct and error rates of a girl in a remedial reading class.

Teacher Evaluation

At the end of the two-year demonstration project, a questionnaire was given to each of the teachers in the four participating schools. The data in Table I were obtained from this questionnaire.

The first question asked the teachers was what they believed they should have known at the beginning of the project. In three of the schools teachers indicated they would have liked more information regarding types of consequences that could be used.

There was also great agreement as to what problems they experienced in obtaining data. The most frequent response from three of the schools was that they had problems rearranging curricular materials.

As to the use and function of data, two schools indicated they felt the data were useful in communicating with the students. When asked about their weakness at the end of the project, the data from two schools indicated they they still felt deficient in interpreting data.

When the teachers were asked how they would like measurement information to be presented, the teachers from two schools indicated they felt it best conveyed by individual training from the adviser. In the two other schools, however, they felt this information best transmitted by in-service credit classes.

Total agreement was reached when the teachers were asked how they could best work with the adviser. The questionnaire data from all four schools indicated that they felt the teacher should initiate these contacts.

When asked how the ideas generated from these projects could be communicated, teachers from two schools believed it could best be handled by grade level seminars, in other words, by groups of third grade teachers or groups of second grade teachers working together. When asked about the form that these presentations should take, teachers from three schools believed that this should be handled by individual teacher presentations, followed by group discussions.

TABLE I

Rank Ordering of Teachers' Responses to Post-Project Questionnaire

	Park Lodge	Graham Hill	Audubon	Sherwood Forest
1. Before you began, did you feel you needed more information on:				
Observation and pinpointing	2	4	1	6
Recording	7	7	5	5
Graphing	6	6	7	7
Interpretation	3	2	2	2
Arrangement of materials	4	5	4	4
Decisions on kinds of consequence	1	1	3	1
Decisions on when to deliver consequence	5	3	6	3
2. How would you have liked this information to be presented?				
Workshops	1	3	3	2
Teacher's meetings	4	5	5	5
In-service credit classes	2	2	4	1
University credit classes	5	1	2	4
Individual training	3	4	1	3
3. What problems have you experienced in obtaining data?				
Pinpointing	2	2	1	3
Recording	3	4	2	2
Problems in making changes before the response (materials, etc.)	1	1	3	1
Problems in making changes after the response (praise, points, etc.)	4	3	4	4

	Park Lodge	Graham Hill	Audubon Audubon	Sherwood Forest
4. In what ways did you make use of the data you obtained?				
Parent conference	5	2	2	1
Curriculum revision	2	5	3	3
Communication with other teachers	1	3	4	4
Communication with the principal	3	4	5	5
Communication with the student	4	1	1	2
5. In what areas do you feel you need additional information in order to continue?				
Observation and pinpointing	5	5	3	5
Recording	8	8	6	9
Graphing	7	7	9	8
Interpretation	1	3	1	5
Arrangement of materials	2	6	4	1
Selection of consequences	3	1	7	4
Application of consequences	3	4	5	3
Self-management procedures	5	2	2	2
Designing data sheets	9	9	8	7
6. How should this information be presented?				
Handouts	7	7	6	7
Files containing information on specific procedures	5	5	5	4
Workshops	2	3	3	2
Teachers' meetings	3	6	7	6
In-service credit classes	4	1	2	1
University credit classes	6	1	4	5
Individual training by the adviser	1	4	1	3

	Park Lodge	Graham Hill	Audubon	Sherwood Forest
7. How could you best work with your adviser?				
Teacher initiates contact	1	1	1	1
Adviser initiates contact	5	3	3	2
Adviser stops by during class	3	5	2	4
Adviser has prearranged meetings within the classroom during school	2	2	5	5
Prearranged meetings after school	4	4	4	3
8. How could ideas best be shared with other teachers?				
A listing of projects in your school and other schools	6	6	7	7
Files containing full reports of completed projects in your school and other schools	7	5	5	5
Meet with other teachers on a 1 to 1 basis	4	3	4	1
Teacher's meetings	3	7	6	6
Workshops	1	4	3	3
Seminars grouped according to subject area	2	2	2	4
Seminars grouped according to grade level	5	1	1	2
9. Form of presentation:				
Presentations follow specific talk outline	3	3	3	1
Presentation-discussion	1	1	1	3
Open discussion during presentation	2	2	2	2

Administrative Data

The following data are from the Bellevue School. Since the data are based on a 500-minute day, a rate of .002 indicates that one activity happened that day (1 event divided by 500 minutes).

Figures 46 and 47 indicate data on trainer contacts with the adviser. Each day the trainer saw or phoned the adviser regarding the project a tally was made.

Figures 48 and 49 indicate papers submitted to the principal by the adviser. In an effort to communicate the progress of the project in the Bellevue School, the adviser periodically gave papers concerning measurement and behavior modification to the principal of the school. Each sheet or page received one tally.

Figures 50 and 51 indicate the number of times the adviser talked to the principal concerning teachers, materials, or children involved with Sherwood Forest Elementary School. Figures 52 and 53 pertain to the times that the principal of the school contacted his teachers.

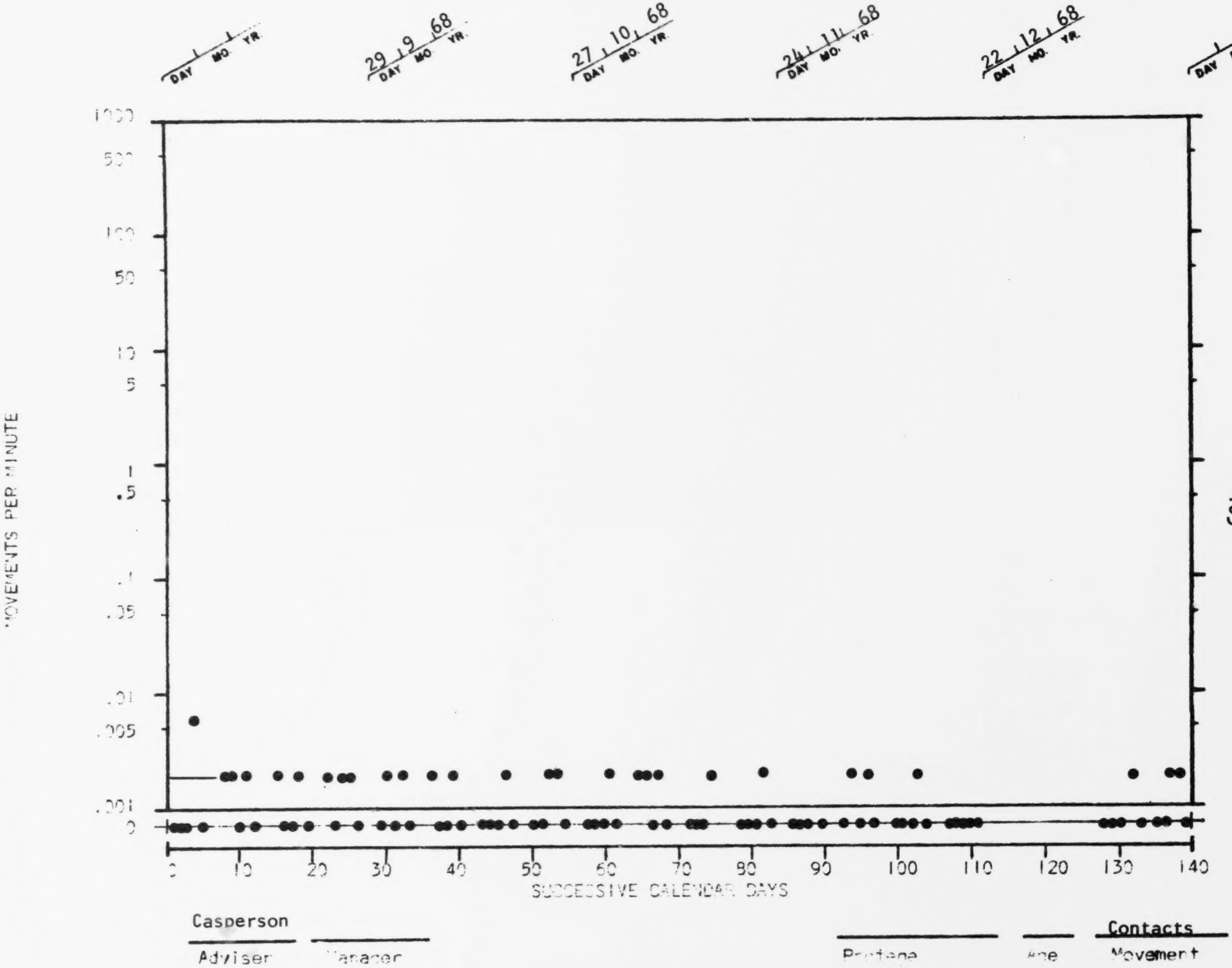

Figure 46. Trainer contacts with the adviser during first semester

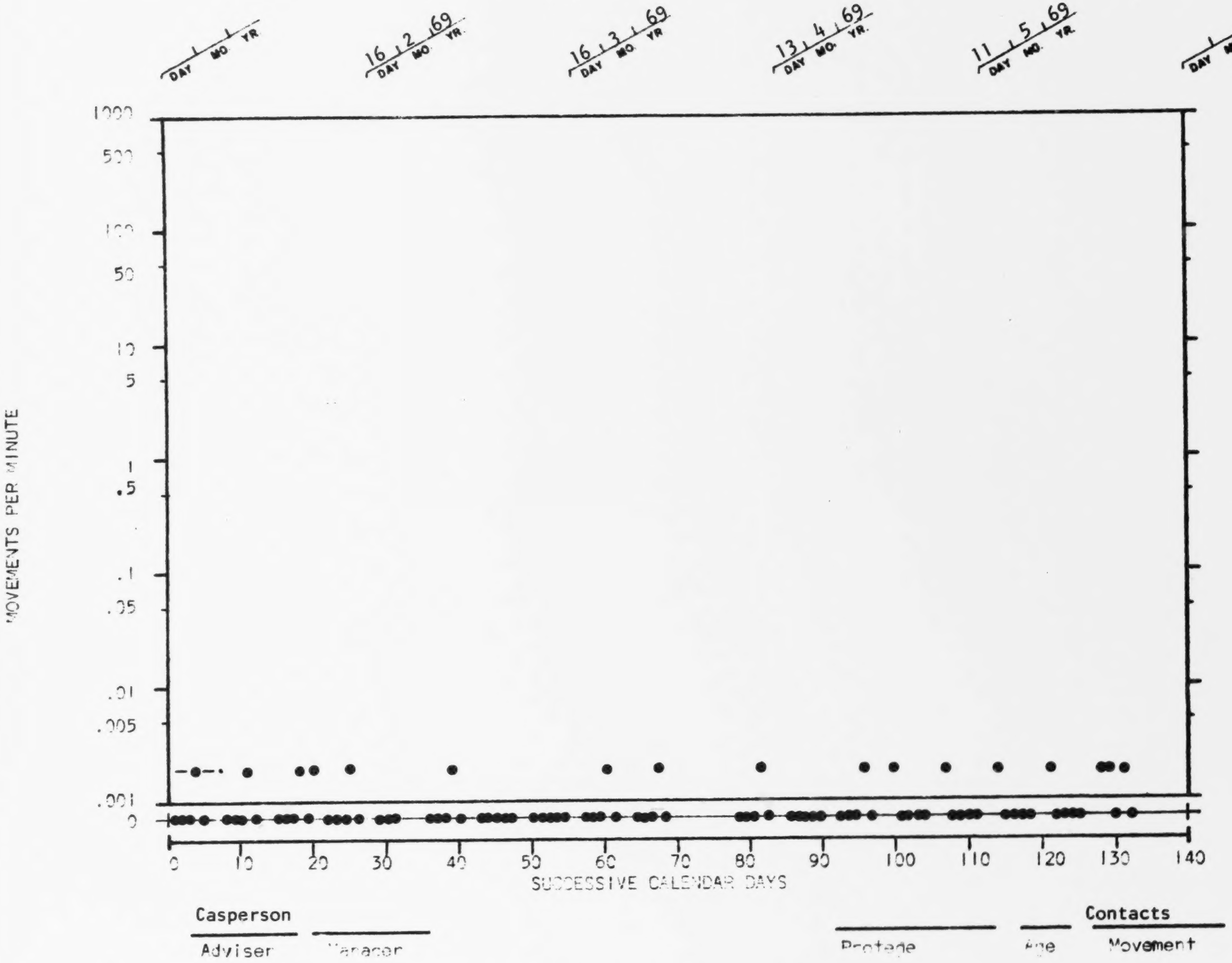

Figure 47. Trainer contacts with the adviser during second semester.

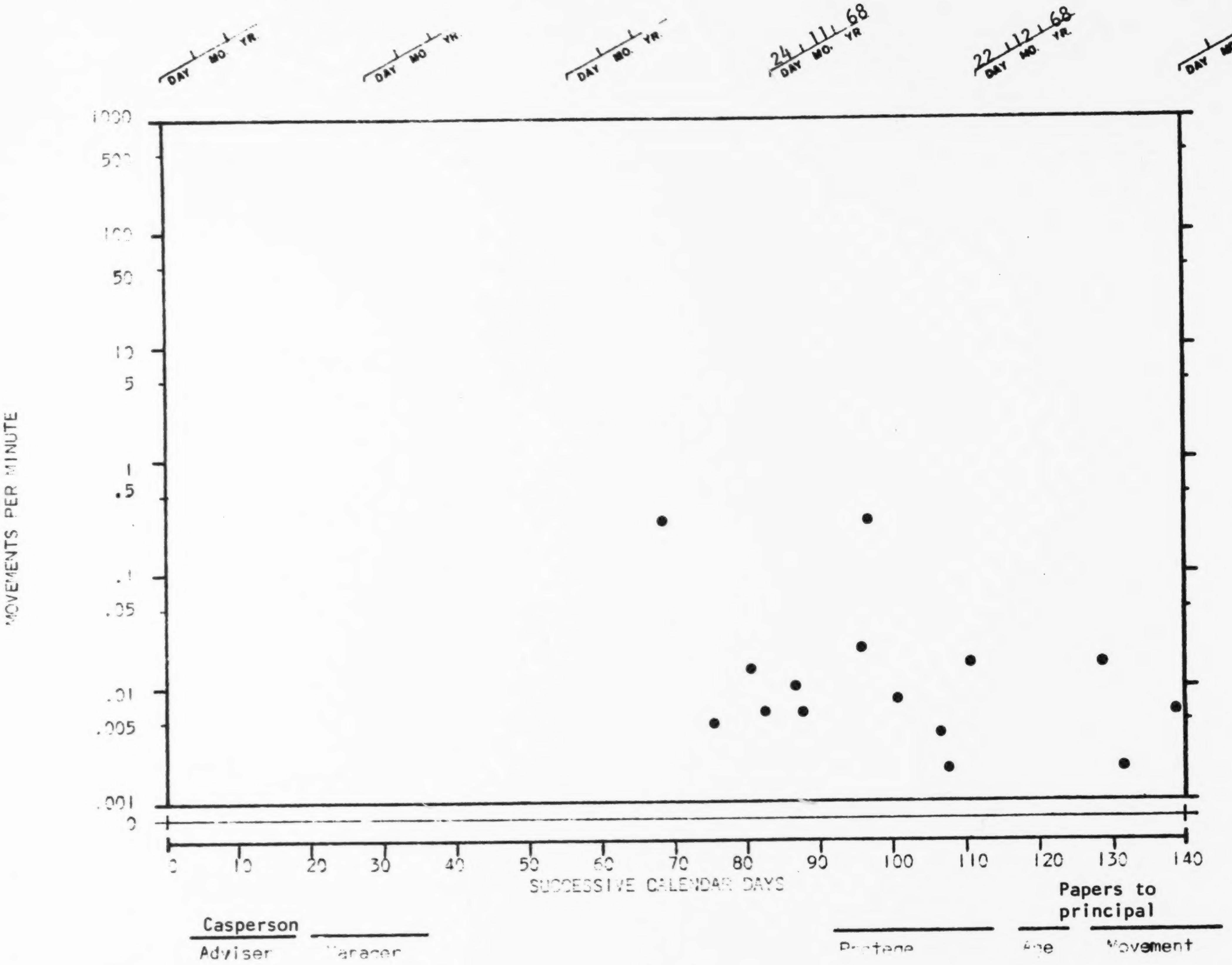

Figure 48. Papers submitted to the principal during first semester.

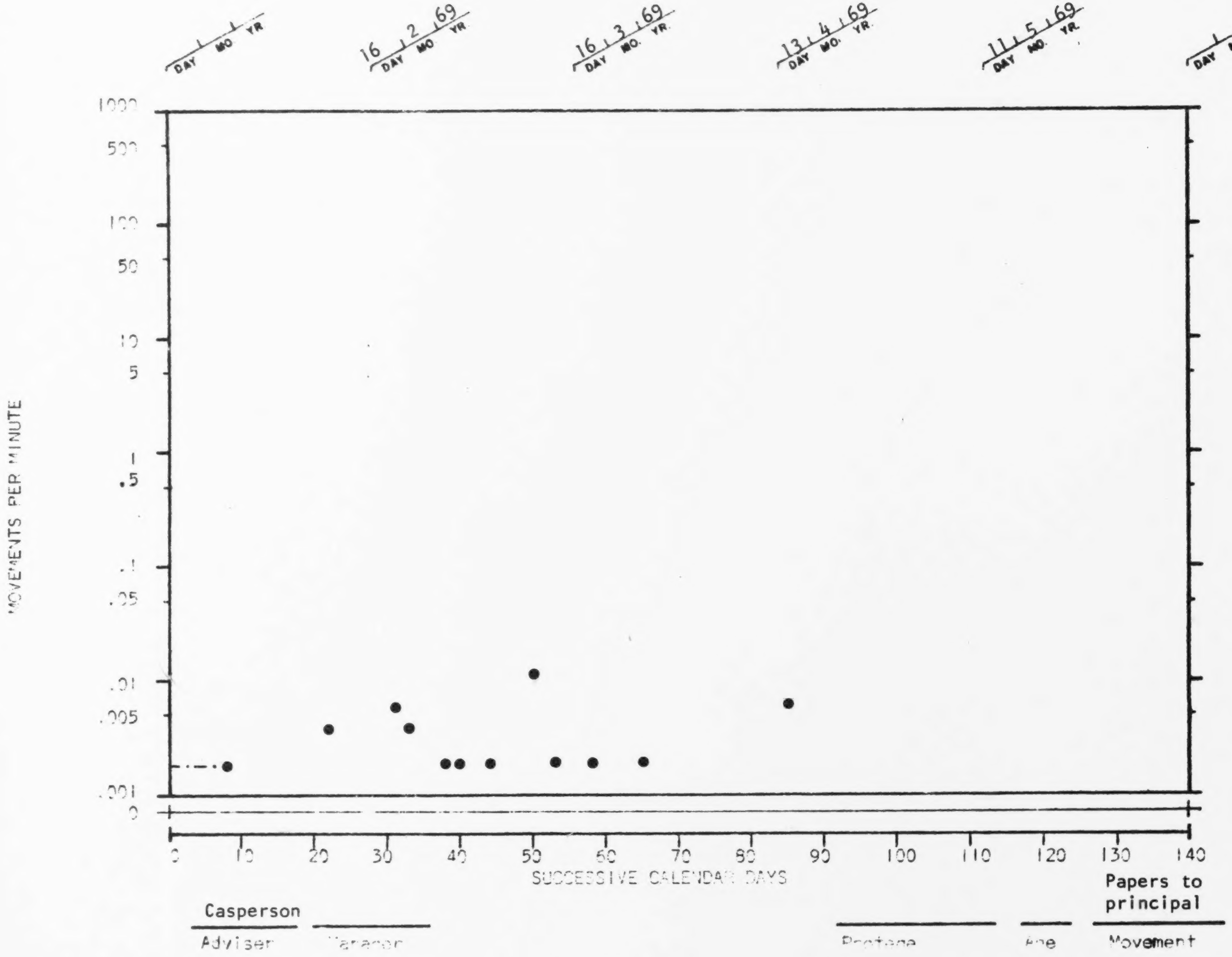

Figure 49. Papers submitted to the principal during second semester.

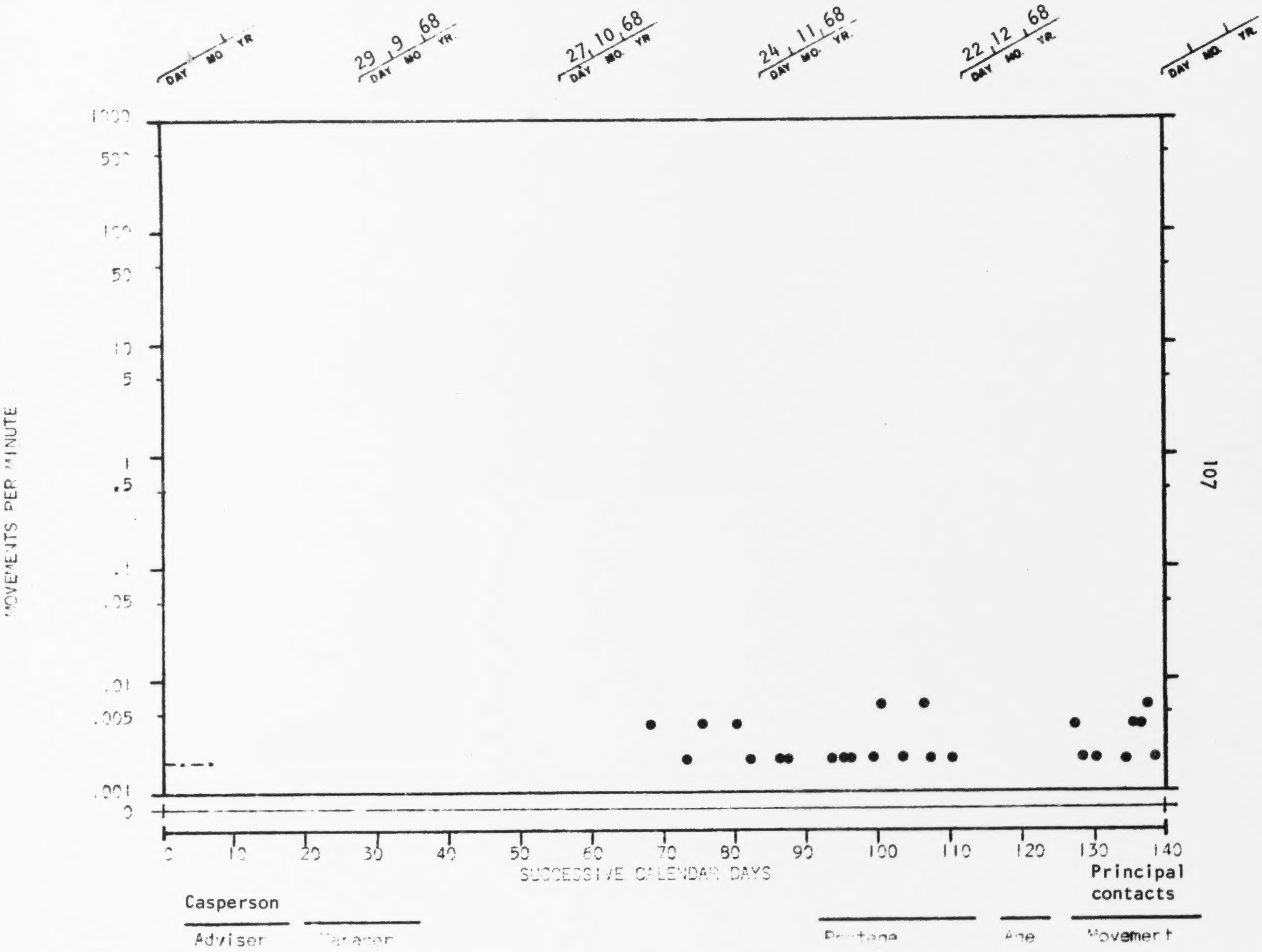

Figure 50. Adviser contacts with the principal during first semester.

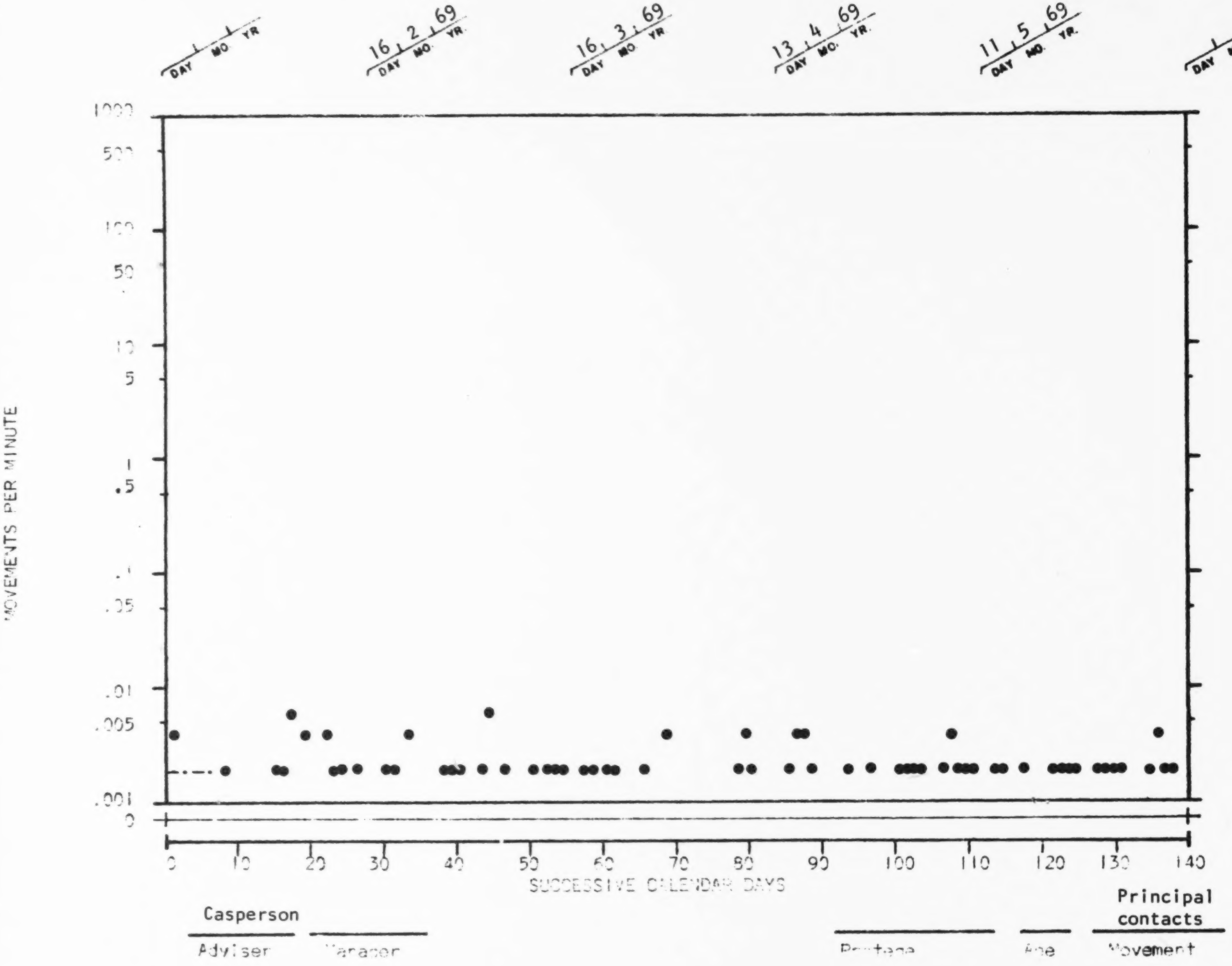

Figure 51. Adviser contacts with the principal during second semester.

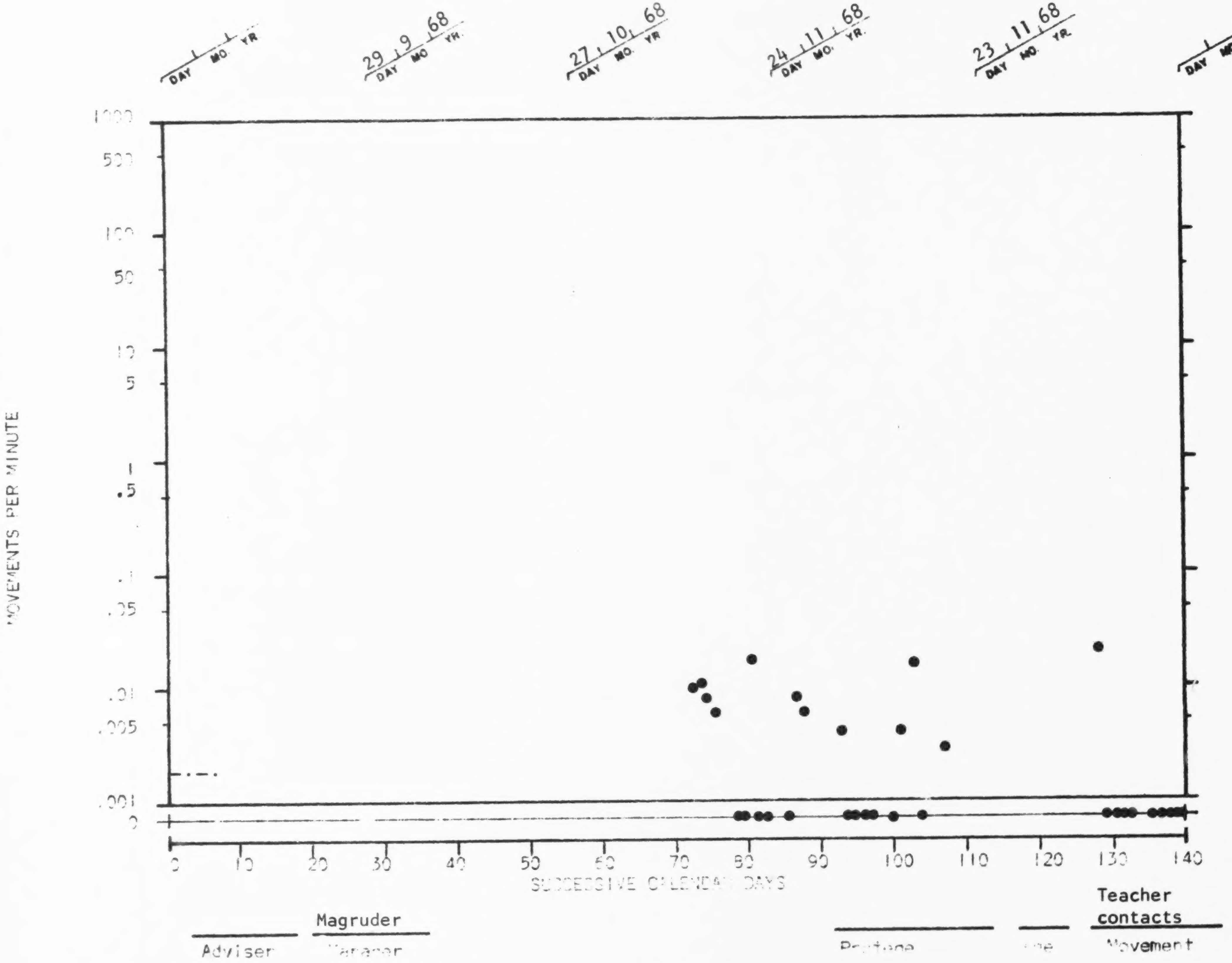

Figure 52. Principal contacts with teachers during first semester.

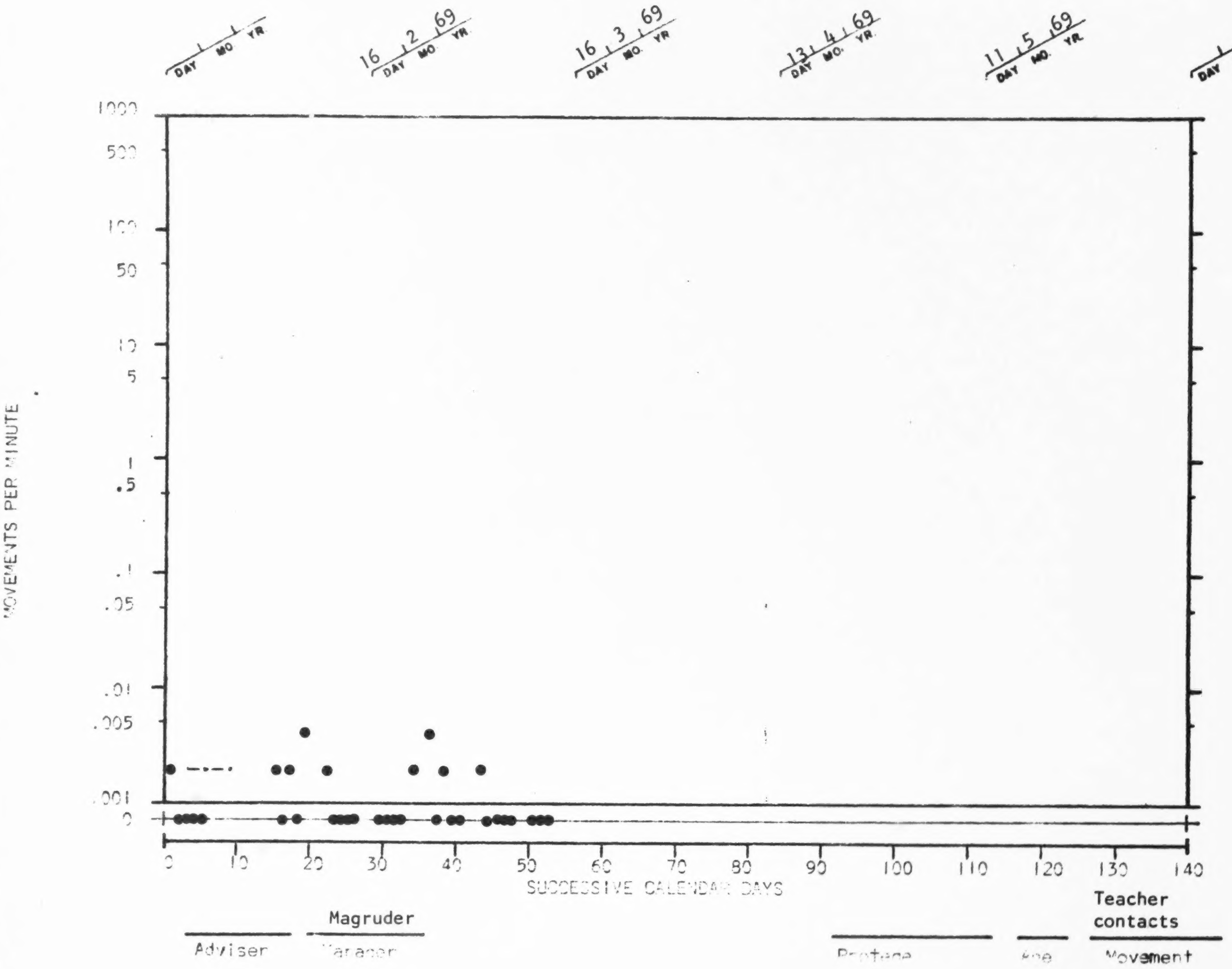

Figure 53. Principal contacts with teachers during second semester.

Part VII

CONCLUSION AND RECOMMENDATIONS

Based on the initial purpose of this two-year project, two conclusions can be made. One, continuous measurement and contingency management techniques can be effectively employed by elementary school teachers, as demonstrated by the four elementary schools participating in this project. By the end of the project every teacher in these schools had collected some data relevant to children, meaning that nearly 80 teachers had collected data from about 2,000 children.

A wide variety of projects were completed, representing children from all grades, 1-6. These projects dealt with managerial behaviors such as talk-outs, hitting others, and being out of seat; others pertained to single children in academic situations such as reading, mathematics, and spelling. Many projects were conducted with groups of children, where teachers obtained continuous measurement from their total class in mathematics, and spelling.

A second conclusion from this project is that advisers can assist teachers to use measurement and management techniques. This approach, direct intervention with teachers in their own classes rather than direct therapy with pupils, is a practical rehabilitation concept for several reasons.

First, the adviser strategy, that of working directly with teachers and indirectly with children, is an economical use of ancillary personnel. Ordinarily, supportive personnel such as school psychologists, counselors, or remedial teachers are deployed in one of two ways. The school psychologist, for example, might come into the classroom and observe the referred child or take him from the class in order to conduct a psychological or educational assessment. By employing these direct intervention procedures, ancillary personnel could see up to 150 children each year. A second intervention plan often followed by remedial teachers is to request classroom teachers to refer those pupils believed to be in need of special assistance. These remedial teachers could perhaps conduct five 50-minute sessions with 3 to 10 children per session. Under optimum conditions and if the remedial teacher returned or rehabilitated some of his clients, he could serve up to 200 children per year.

By contrast, if the adviser is programmed for direct intervention with the teacher rather than the pupil, more pupils can be served. As this project demonstrated, in all four schools virtually all of the children were involved throughout the year in some sort of measurement project. Furthermore, many of these students were measured repeatedly, not just for a single assessment or a few weeks of remedial work.

A second reason the adviser plan is effective is that teachers are assisted and encouraged to obtain data not only from exceptional children, but also from normal pupils. Traditionally, only pupils who display deviant behavior receive special attention, while normal children are rarely given such attention. Criticism has frequently been directed toward schools for this attention imbalance. In this project all pupils special and regular, were dealt with; in fact, more data were obtained from normal children than exceptional.

Although early in the project the majority of the advisers' efforts were directed toward solving "special education" problems such as talk-outs, out-of-seats, hitting others, or poor performance in math or reading, a change of emphasis was noted near the completion of the project. As illustrated in the Results section of this report, numerous total class projects were conducted where continuous measurement was obtained in academic areas such as reading, writing, mathematics. By obtaining data from all pupils, teachers could identify children with slight learning problems and consider their particular needs.

A third reason the adviser system is functional is that by working directly with teachers, advisers can instruct them to deal with their own problems. If, as is sometimes done, teachers are relieved of their responsibility by the advisers taking the pupil away for rehabilitation and sending him back when cured, only the immediate situation is solved. Conceivably, the next time a teacher has a problem she will again call in the rehabilitation person. If instead, the teacher is instructed to deal with her class problems, she improves as a classroom manager each time she handles a managerial or academic problem. By successfully solving vexing classroom situations as they occur, not only is the immediate problem overcome, but future instances can be solved with increased acumen.

Recommedations

Based on the experiences of this project, eight recommendations regarding the establishment of future projects should be presented.

Teachers should and can change behavior. Many teachers, although in the business of rehabilitation, hence modification, are reluctant to change certain behaviors. Although aware that they should change the child's behavior in reading, writing, and arithmetic, they are reluctant to change "real" behaviors such as personality development and creativity, for fear of inhibiting a child's individuality. Teachers must be convinced that they should change behavior, for if they do not modify pupil behavior, someone else will--perhaps someone less humane, skilled, or perceptive.

Teachers also need to be convinced that they can change certain behaviors. Some teachers suppose that pupils behave the way they do because of heredity, that pupils can't read because their parents can't read, or that pupils misbehave because their parents are irresponsible. Thus, the teacher often merely laments rather than rearranging the environment so the child will behave more appropriately. Others feel that what they as teachers do at school to educate a child is wasted at home. They say, "We can't expect this child to learn, because his father is a drunk and his mother is a prostitute. What good does it do to teach him to read when no one attends to him at home?" This teacher must be convinced that it is her responsibility to alter the boy's reading at school and that regardless of the lack of cooperation in the home, she is still obliged to attempt to instruct the child. Although a harmonious and cooperative relationship between the home and school is desirable, learning can take place when circumstances are less than ideal.

There are also teachers who believe that some pupils cannot learn because of limited motivation and say, "He can't be taught to read because he's not interested." This suggests it is the child's responsibility to bring to school his own supply of motivation, just as he brings his peanut butter and jelly sandwich for lunch. A pupil's interest can be changed; therefore, it is the teacher's responsibility to arrange instructional settings that are motivating.

Other teachers seem to believe that individuals behave the way they do because of random circumstances. They are unaware of the systematic relationships between behavior and relevant features of the environment, and therefore assume that little can be done to alter the pattern of a pupil's behavior. They see little relationship between behavioral events and believe that regardless of which circumstances are arranged, human behavior is not amenable to empirical control.

Other less predetermined teachers believe behavior can be altered, but only by attending to stimulus conditions. According to these individuals if one curriculum doesn't work, another is tried; if that fails, a third is selected in a quixotic search to find the magic curriculum. Similarly, these stimulus-bound teachers, when faced with a managerial problem, implore, then they promise, bribe, threaten. This set of teachers, although convinced of the function of arranging environments, are apparently unaware that subsequent events also play an important role in the acquisition and maintenance of behavior.

It is highly recommended that others considering future teacher-training projects instill the philosophical notions that 1) pupil behavior should be changed by teachers, and 2) pupil behaviors can be changed by an orderly arrangement of the environment. Teachers must also be shown how they may affect behavior by rearranging any one of several behavioral components.

Curriculum adaptation. The second recommendation concerns obtaining continuous academic measurements--a matter of extreme importance to teachers. Perhaps the biggest difficulty in obtaining continuous measurement in academic areas is the curriculum itself, for many texts and workbooks are organized in a haphazard way. Some math books, for example, have one page of addition facts, followed by a page of division facts, followed by a page of story problems. It is impossible, in such situations, to interpret data from the program; for if a child's rate goes up or down from one day to the next, one cannot be sure whether the change was because of some arranged environmental event or merely the function of the curriculum.

An initial chore of the adviser should be to locate programs suitable for measurement, where the response units from one problem to another and one page to the next are relatively similar and progress in a rational and coherent manner. The initial step required prior to the selection of any program or arrangement of teaching units would be for teachers to specify exactly the elements in reading, math, or social studies they expected to teach. Once these objectives were listed, the second requirement would be to locate materials designed to accomplish these ends. This could mean searching for existing commercial programs, revising current programs, or totally rewriting instructional materials.

Pupil-recording. Another recommendation relevant to teachers' efforts to obtain continuous measurement deals with pupil-recording. If teachers are expected to obtain continuous measurement in classes of 30 children, it is unreasonable to request them to assume all of the clerical duties. Therefore children must be taught to handle these tasks. In this project children assumed all or portions of the data-gathering duties in several situations.

Basically, only two pieces of information are required in order to obtain daily rate measures--the total time involved in a program and the number of answers, correct and error. Rate can be caluclated by dividing the number of problems, correct and error, by the total time. When teachers provide data procurement sheets with blanks for these data to be entered, many children can readily comply. Children must first be taught to record the beginning and ending times of a program and to calculate their total time on the program. They must also be taught to count the number of correct answers and errors, to divide by the total time, and to plot these correct and error rates on a chart. Beyond these basic requirements, pupils may be taught to evaluate their day-by-day progress.

Teaching self-management skills to children not only assists teachers by relieving them of many managerial chores, but adds to the pupils' mathematics program. In order for a pupil to manage his own record he must count, add, tell time, subtract, divide. Presumably, the pupil will be more motivated to learn these skills when the situation is natural and concerns his performance then if the instructional setting is artificial.

Pupil-management should be a part of the educational curriculum just as math or reading. When children are taught self-management, not only are they assisting their teachers and simultaneously learning a number of arithmetic skills, they are learning to manage many aspects of their own behavior. They are learning, in a small way at least, that if there are certain features of their own behavior that they wish to alter, maintain, or change, it is their responsibility to do so.

Natural versus synthetic consequences. Another consideration for the implementation of future continuous measurement and contingency management projects in elementary schools would be to stress the use of natural consequences. It is extremely important to aid teachers to identify and use natural consequences when they desire to alter behavior. Formerly, teachers using an operant framework attempted to alter pupil behavior with the ubiquitous M & M. If a child were being taught to read, he would be given an M & M contingent upon each reading response. If he were being taught to sit quietly, an M & M would be taken away contingent upon each seat-twitch. Many teachers became skeptical of behavior management when they saw this use of synthetic consequences, calling it a "form of bribery" to make a person do something he should want to do without reinforcement. These criticisms were partially valid; teachers should not use synthetic consequences, but should be encouraged to use natural consequences. They should be instructed to employ artificial reinforcers only when natural consequences have not proven functional.

Natural consequences in most classrooms are abundant, and some teachers currently arrange such events with great skill. Recess can be arranged contingent on adequate completion of the mathematics assignment. Other leisure-time activities, such as the library corner, the science center, or the hobby area can be used as consequences--the pupil being required to do something before the activity is granted. Erasing the blackboard, cleaning the erasers, sitting in a favorite seat, passing out announcements to be taken home, taking messages to the office, wiping the tables after lunch, assisting another pupil with his mathematics, or in some instances, performing more mathematics are only a few of the possible consequences available in the classroom. The availability of adequate and ample natural consequences is limited only by the creativity of teacher and adviser.

Furthermore, the teacher who arranges natural consequences, those things already available in a classroom, is a more efficient programmer than one who uses synthetic consequences. For when synthetic props are used, they must eventually be removed if the child is to live in a natural environment.

Data interpretation. A fifth recommendation is to train future teachers in data interpretation. There were instances where elementary teachers obtained continuous measurement, but could not explain the meaning of this information. They had apparently viewed measurement as an end rather than a means.

Teachers must be shown that the data they have kept has a function, for example, that measurement can tell them how to arrange the seating of their classes or when to advance a child from one book to another. They must be taught to use data to evaluate any teaching aid, tactic, or procedure used to instruct pupils.

Furthermore, teachers must be instructed to use data as a communicative device. Parents have been told that their child is in either the Bluebird or Jaguar group in reading, and that he is receiving either a C- or a B+ in math. If educators expect to enlist the confidence and support of parents, communication with them must be direct and frequent. Parents must be told exactly what their children are doing, which add facts they are able to perform, which words they can read, which scientific or social studies concepts have been developed. Not only must communication with parents be more exact and direct, it should be more continuous than in the past. Parents deserve to know the competencies of their children more often than every six weeks.

Teachers must also be taught to communicate continuously and objectively with fellow teachers. In order to provide coherent and sequential educational programs for children, teachers must transmit pupil records from year to year that precisely reflect pupil performance. For example, the second-grade teacher must submit information to the third-grade teacher that will enable the latter to begin educating a pupil where the former left off. Teachers must precisely report the competencies of children in math, reading, social studies, and science. They must also report which curricular offerings and managerial techniques proved successful for each of their children and which techniques failed. Teachers must report these procedural matters with enough detail so that succeeding teacher can easily continue to program successful educational conditions.

Teachers must be taught to use data to communicate with their principal about the educational progress and requirements of their classes. If, for example, a teacher has a managerial problem in his class, he should interpret this fact to the principal through objective data, not simply by stating that the child is irritating. Teachers would also find data useful when requesting assistance in the form of additional materials or personnel for their class. They could provide principals with data showing, for example, what could be accomplished in their classes by a language master or a part-time assistant. Finally at the end of each year, teachers should provide their principals summary data that illustrates the achievement of their group. These data should reflect the continuous advancement of all of their children in several academic areas.

Teacher participation: Structured versus permissive. Two recommendations relevant to teacher training should be presented; the first is concerned with teacher involvement. One approach is to allow teachers to participate in such a program to the extent they desire. An alternate strategy is to request the teachers to take part by issuing a district- or school-based mandate. In this project, there were two schools where participation was optional and two where involvement was expected.

The objectives of the school undertaking a teacher-training program would dictate which of the two options was preferred. If a school's objectives were for all teachers to involve as many pupils as possible in measurement activities, then it would seem reasonable that the structured approach would be best. However, were a school's objective to involve only skilled and interested teachers, then the permissive approach would be more appropriate. One of the drawbacks of requiring teachers to participate in measurement projects is that the adviser could expend much of his time with disinterested or unskilled teachers. On the other hand, if teachers can choose whether they wish to get involved in measurement, it is possible that only a few will take advantage of the opportunity; for teachers, like many of us, are no more precise than necessary.

On the basis of this project, a tentative recommendation could be made, however, to require teachers to do at least some measurement exercises, but assigned on an individual basis. In two of the schools in this project, the teachers were expected to conduct a series of measurement exercises--first to rehabilitate a managerial problem, then to rehabilitate an individual child on a specific academic problem, and third, to conduct a group measurement project. Although this sequence was functional for certain teachers, it was not for all. For those teachers who had several naughty children in their classes, beginning with a managerial project was appropriate. However, their second and perhaps additional projects should also have been of the managerial type. For those teachers who had no managerial concerns, they would best have begun with academic projects rather than unimportant managerial behaviors. Although the advisers of the project had recognized the importance of individualizing the curriculum and procedures for pupils, they did not always individualize training components for the teachers.

Teacher-training: Synthetic or natural. A second recommendation involved with teacher-training concerns the training site. Should teachers be trained in demonstration classrooms, in their own classrooms, or in some combination of the two? In this project, demonstration classrooms were used in three of the four schools. The majority of the training received by the teachers, however, took place in their own classrooms.

The primary purpose of the demonstration class at Graham Hill (Seattle) was to establish remedial reading situations for two groups of pupils. These classes provided continuous measurement with mild contingencies in effect. When the pupils had progressed satisfactorily they were sent back to their original classes. While the demonstration classroom was functioning, teachers from Graham Hill were scheduled for observations. The purpose of these visits was to instruct the teachers in pinpointing behaviors, counting, and charting.

The purposes of the demonstration classroom at Park Lodge (Clover Park) were the same as those at Graham Hill. The demonstration class served both to remediate underachieving students of various ages and to train teachers.

The purposes of the demonstration class at Sherwood Forest (Bellevue) were somewhat different. The pupils in this class were second graders who although not excellent readers, were not designated as rehabilitation candidates. The primary function of the Bellevue demonstration class was to define, sequence, and teach a number of self-management skills. Meanwhile, teachers from Sherwood Forest were scheduled to visit the classroom to participate in exercises similar to those required at Graham Hill and Park Lodge.

In all four schools the majority of the teacher-training was conducted in each teacher's room. In each school, whether it followed a structured or a permissive strategy, the projects that dealt with on-going assessment and/or modification were conducted in each teacher's own class.

Although it cannot be conclusively stated, it appears that some combination of the two sites, the demonstration class and the teacher's own class, is the most effective way to train future teachers. Some aspects of continuous measurement and contingency management can best be taught in a demonstration classroom. In the demonstration classroom the teacher could be taught certain fundamental principles of behavior--that behavior can, in fact, be altered by the systematic programming of environmental elements, attending to "good" behaviors, ignoring "bad," and establishing and consistently maintaining classroom rules and contingencies. Also, the rationale for continuous measurement and contingency management can perhaps best be explained in a demonstration class setting. Technical matters, too, can easily be dealt with in the demonstration setting. Teachers could be taught to pinpoint behaviors, to count and chart, to obtain data from their current curricular materials, to revise texts and workbooks to obtain continuous measurement, and to be aware of other curricular options. While visiting the demonstration room, methodological rules could be explained to teachers--that once a behavior has been pinpointed, it should be assessed for a few days before any remediation is attempted; and when procedures are altered in attempts to effect behavioral rate, only one event should be altered at a time. They could, finally, be shown how to interpret the data once it has been obtained and how to use data for purposes of making decisions and communication.

Once these fundamentals are acquired, the teacher's training should take place in his classroom. They must conduct measurement projects and make remediation attempts with their own children. Teachers must be taught to work with the unique behavioral characteristics in their classroom, to list the objectives of their class, to arrange curricular materials meaningful for their students, to deal directly with the managerial problems that they face, and to rearrange motivational environments appropriate for their children.

Principal involvement. A final recommendation from this project pertains to principals of schools where measurement is being stressed. Throughout this project, the advisers became quite sophisticated in the history of operant conditioning, behavior modification, and precision teaching. They became skilled at observing behavior, adept at charting, and highly competent in programming a variety of materials and procedures. Furthermore, when advisers began assisting teachers, they became aware that certain teachers were good contingency managers and others were not, that some teachers were more skilled at selecting and arranging curricular materials than others. Thus, the advisers developed not only a skill and a technique that their principals did not possess, but in many cases, they knew the teachers and pupils of the school better than their principals.

The only formal training received by the principals was during the summer workshop at Clover Park following the first year of the project. While there, each principal was required to conduct one project, not necessarily involving measurement, attend some meetings, and listen to a number of speakers. Following this workshop two of the principals requested and were provided periodic readings in behavior modification. No systematic program, however, was scheduled either to assist principals to develop a rationale concerning measurement or to assist them in interacting with teachers who were or were not measuring pupil performance.

In future projects, it would be vital to design a training program for the principals. The principal must initially develop a rationale for measurement that he is able to articulate to his staff, the administration, and the community. Then he must become knowledgeable as to continuous measurement techniques, keeping data relevant to his role as a principal--his rate of seeing teachers, parents, pupils; of going into classrooms; of contacting people at the central office. Only by keeping data, interpreting data, and becoming involved in measurement can the principal totally understand the impact of continuous measurement. In addition, the principal must be taught how to interact with teachers who are teaching precisely--to reinforce them for their success. Finally, the principal must be taught to communicate with other principals, his teachers, the administration, and parents through data.

APPENDIX

#46

CAREER INCENTIVE PLAN

Application for Extended Contract for Work on Phase II Projects

SUBMITTED BY: Staff at Sherwood Forest Elementary School

SUBJECT: REMEDIAL - SOCIAL BEHAVIOR

PROPOSED PROJECT - CAREER INDENTIVE PLAN
1968

Remedial - Social Behavior

Currently the staff of Sherwood Forest Elementary is participating in a research project sponsored by the U. S. Office of Education and supervised by the Experimental Education Unit of the University of Washington. The project, *The Application of Functional Analysis of Behavior by Teachers in a Natural School Setting*, involves the classroom teacher in diagnosing and prescribing programs for children which apply the principles and procedures of functional behavior analysis with children who have learning disabilities and social behavior disabilities in the regular elementary schools by teachers who have been instructed to use these procedures.

Our proposal for CIP monies is as follows:

1. A five day, four hours per day workshop, August 19-23, involving the building staff in the principles and procedures of behavior analysis.
2. Demonstration teaching involving pupils from the school.
3. Utilization of the staff of the Experimental Education Unit of the University of Washington for resource personnel.

The University of Washington has agreed to finance the honorariums of the five staff members in conducting the workshop.

The salary of a staff teacher will be paid by the research grant. This staff member will be under a training program at the University of Washington and will serve as a full time resource person in the building for the next two years.

Close cooperation between the school and the district's special education unit will possibly lead to a reduction in the numbers placed in special education classes, the revision of the structure of guidance service now in effect, and a more efficient method of diagnosing and prescribing of programs for the socially or academically handicapped child.

Information gathered from the project will be shared with district staff through evaluation by the guidance department of the district as the program progresses.

The cost of the total project will be shared by the University of Washington and the school district.

U. of W.	District
Resource Teachers Salary $9,000	Equipment and facilities $5,000

The proposed cost of the Workshop will be shared by the University of Washington and the district CIP if approved.

U. of W.		CIP	
Honorariums of five staff members at $100 per day	$1,250	Salary for 18 building teachers at $5.50 per hour	$1,980
		Salary of a demonstration teacher	$ 300

The orientation of staff to the principles and procedures behavior analysis and the assignment of a full time trained resource person to the staff will greatly increase the classroom teachers skill in dealing with problems of behavior and academic disabilities. Skill in behavior modification and programming for the individual child will reduce the total need of special placement for many children and increase the effectiveness of the teacher in dealing with academically deficient children through more effective planning and use of programmed materials.

The total project has been developed through Dr. Mattick, Mr. Lowe, Mrs. Van Nostram, Mr. Ernst, Mr. Gering, Dr. Clark, Miss Casperson, the staff at the Experimental Education Unit of the University of Washington, Dr. Brubacker and Bill Morton.

Behav. Res. & Therapy, 1969, Vol. 7, pp. 151 to 156. Pergamon Press. Printed in England

THE USE OF A FREE-TIME CONTINGENCY WITH FOURTH GRADERS TO INCREASE SPELLING ACCURACY

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University of Washington

(*Received* 31 *October* 1968)

Summary—This investigation was conducted in a fourth grade class of 32 pupils in a public school. The study assessed spelling performances of the group as a function of three conditions—(1) when traditional procedures were in effect, (2) when contingent free-time was individually arranged, and (3) when a group contingency, listening to the radio, was added to the individually obtained free-time. As a result of these procedures, the majority of the pupils' spelling performance increased, indicating that the use of contingent free-time and radio-listening were effective reinforcers.

THE PRINCIPLES of contingency management have been widely demonstrated in clinical or therapeutic settings where one investigator manages the behavior of one child (Ullmann and Krasner, 1965; Ulrich, Stachnic and Mabry, 1966; Sloane and MacAulay, 1968; Bijou and Baer, 1967). The majority of these reports describe the efforts of one examiner managing the behavior of a single subject, and are generally concerned with the alteration of a social response such as hitting, throwing objects, crying, or having temper tantrums.

Other investigations have described the further extension of contingency management procedures. Recent reports have shown how the principles of systematic behavioral management may be applied by the classroom teacher not only to decrease inappropriate social behavior, but also to increase certain types of academic behavior. Clark, Lachowicz and Wolf (1968) demonstrated that when a token economy was instituted with a group of Neighborhood Youth Corps girls, their academic progress, as assessed by the California Achievement Test, surpassed a control group that functioned on a noncontingent basis. McKenzie, Clark, Wolf and Kothera (1968) further demonstrated that when parents granted contingent allowances for grades, the academic performance of children in special education classes increased. In both of these studies, where groups of children were involved and where the strategy was to increase some academic behavior, the managerial system was administered by a public school teacher.

The intent of the current report was to contribute further evidence that a single classroom teacher can initiate and administer a contingency system with groups of children for the purpose of increasing academic performance. Furthermore, this investigation attempted to illustrate how the acquisition of regular and continuous behavioral data could enable the classroom teacher to make objective programing decisions.

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* Demonstration teacher and

† Classroom teacher at Graham Hill Elementary School, Seattle, Washington.

The current investigation assessed the spelling performances of a group of fourth graders as a function of three conditions: first, when traditional procedures were in effect; secondly, when contingent free time was individually arranged; and finally, when a group contingency was added to the individually obtained free time.

METHOD

Setting and subjects

This investigation took place in a regular fourth grade class of 32 pupils in Seattle, Washington. The students in this class were from middle or upper middle class homes and were of normal or above normal intelligence. The class was conducted entirely by the regular classroom teacher, who administered the spelling program, calculated and graphed the pupils' scores, and managed the contingency system. The teacher was advised by a member of a demonstration project aimed at initiating procedures for continuous measurement in the elementary schools.

Procedure

During the first phase of this study (11 weeks) spelling was scheduled in a rather traditional manner. On Monday of each week, Lesson A from the 4th grade *Spelling For Word Mastery* (1959) text was scheduled. This lesson required the children to read a story containing that week's spelling words, then to say and write the new words. For example, the pupil was required to use one word from a list of new words to fill in a missing blank. On Wednesday, a trial test was given. On Thursday Lesson D was programed, which involved completing an exercise containing about five answers, similar to Lesson B, and in addition, writing each of the spelling words. Each pupil's grade on the final Friday test was recorded in terms of percentage correct. Throughout this first phase the only contingencies in effect were report cards and unsystematic social approval from the teacher and peers.

During the second phase of the study, which extended for 10 weeks, the spelling procedures were the same—following the suggested plan in the text. Now, however, following the intial presentation of the words on Monday, the children were merely assigned spelling lessons B and D and were required to hand them in by Wednesday. No specific classroom time was allotted for the completion of the work during this phase.

Throughout Phase 2, final tests were given on Tuesday, Wednesday, Thursday, and Friday of each week. During this phase, when the pupil received a 100 per cent score he was not required to continue taking spelling tests on the remaining testing days of that week. For example, if on the Tuesday test a pupil received a 100 per cent score he was allowed, during the Wednesday, Thursday, and Friday spelling test period, to either read a library book or engage in any other school relevant activity at his desk.

For those students who did not achieve a perfect score on the Tuesday test, their papers, with the corrections, were returned 15 min prior to the Wednesday test. This same procedure was practised prior to the Thursday and Friday tests. The students were not required, however, to write or orally recite the misspelled words after the papers were returned. The returned papers may have simply functioned as a cue or discriminative stimulus that another spelling test was about to be given.

Throughout this phase the teacher recorded the pupil's score as 100 per cent if he returned a perfect spelling paper on Tuesday, Wednesday, Thursday, or Friday; otherwise, if the pupil never achieved 100 per cent, his Friday score was reported. Furthermore, the teacher recorded which day was represented by the score, 1 = Tuesday, 2 = Wednesday, 3 = Thursday, and 4 = Friday.

During Phase 3 of the study, which extended for three weeks, the procedures were the same as those in effect during Phase 2. On Monday the weekly words were presented; Lessons B and D were assigned to be submitted on Wednesday; and tests were given on Tuesday, Wednesday, Thursday, and Friday. The same contingency was in effect—when the pupil achieved a 100 per cent score he was allowed to engage in a free time pursuit rather than required to continue being tested. An additional contingency was added, however. When on any given testing day all of the pupils received a 100 per cent score, the total class was allowed to listen to the radio for 15 min.

RESULTS

Figure 1 illustrates the group data during the three experimental phases. Depicted in the figure are the total number of perfect papers recorded per week. As noted, during Phase 1, where the spelling was taught by traditional techniques, the range of 100 per cent scores for the 11 week phase was 11—from 4 perfect papers on the second week to 15 during the ninth and tenth weeks. The median number of perfect papers during Phase 1 was 12.

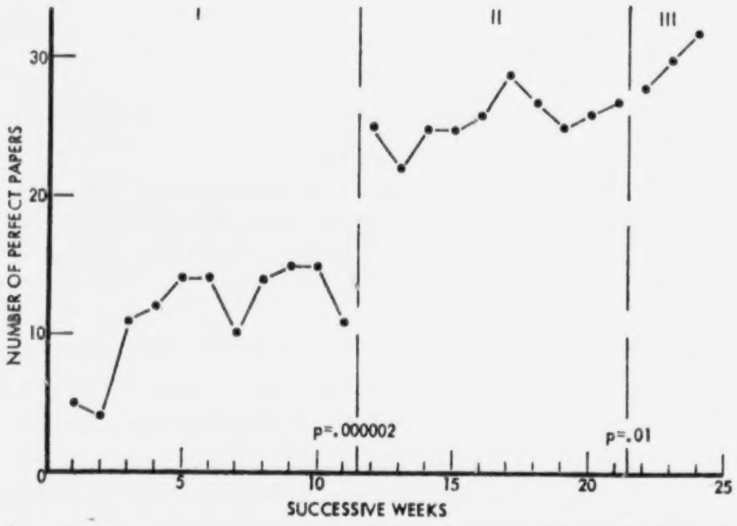

FIG. 1. Number of 100 per cent papers recorded each successive week throughout the three experimental conditions. The *p* values reflect the degree of significance between adjacent conditions.

A median number of 25·5 perfect papers was calculated in the 10-wk second phase, when obtaining free time depended upon obtaining a perfect score. The range of perfect papers throughout this phase was seven, from 22 to 29. When the median data from Phases 1 and 2 were subjected to the Fisher Test of Exact Probability, a probability score of 0·000002 was obtained.

During the brief third phase of the study, when a group contingency—listening to the radio—was added to the individually contingent free time, a median of 30 perfect papers was revealed. When this median was related to the median of Phase 2, a probability score of 0·01 was obtained.

Of the 32 members of the class, the median scores of 19 pupils improved in spelling accuracy from Phase 1 to Phase 2. The remaining 13 who did not improve were pupils whose median scores during Phase 1 were already 100 per cent. Similarly, the median scores improved for only three pupils from Phase 2 to Phase 3, since the median scores for the 29 others were already at 100 per cent during Phase 2.

Figure 2 depicts a pupil who improved greatly when the reward of free time was added during the second phase. As noted in the Fig., S31's median percent correct throughout Phase 1 was 80 per cent, but it increased to a median of 100 per cent during Phase 2 and continued to be 100 per cent in the final phase. When the data from Phases 1 and 2 were applied to the Fisher Test, a significance of 0·001 was revealed.

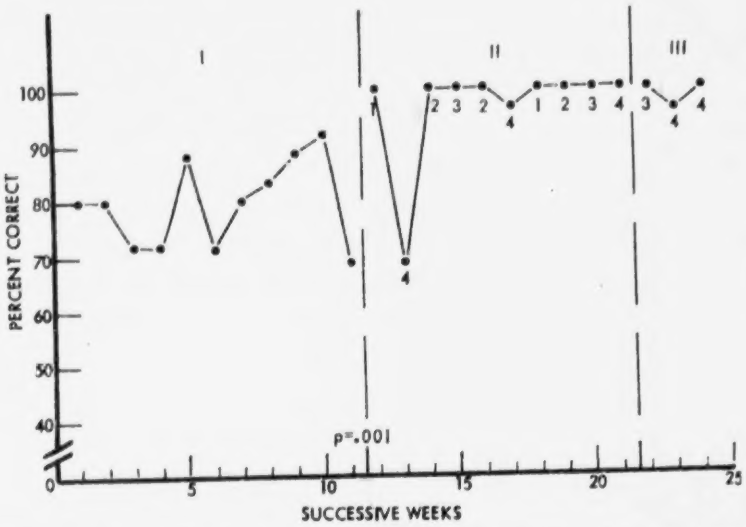

FIG. 2. S 31's percentage scores throughout the investigation. The numbers beneath the data points during conditions 2 and 3 correspond to the day of the week that S 31's score was recorded (1=Tuesday, 2=Wednesday, 3=Thursday, 4=Friday). The *p* value indicates the degree of significance between conditions 1 and 2.

Figure 3, representing S15, reveals a pupil's record that also improved significantly from Phase 1 to Phase 2. During Phase 1 this pupil's range of scores was from 32–68 per cent, whereas his range of scores in the second phase was from 72–100 per cent. A median of 48 per cent was calculated during Phase 1 and 80 per cent in Phase 2. These median data, when subjected to the Fisher Test, revealed a probability value of 0·0001. During the three week third phase the S's three scores were 76, 100, and 100.

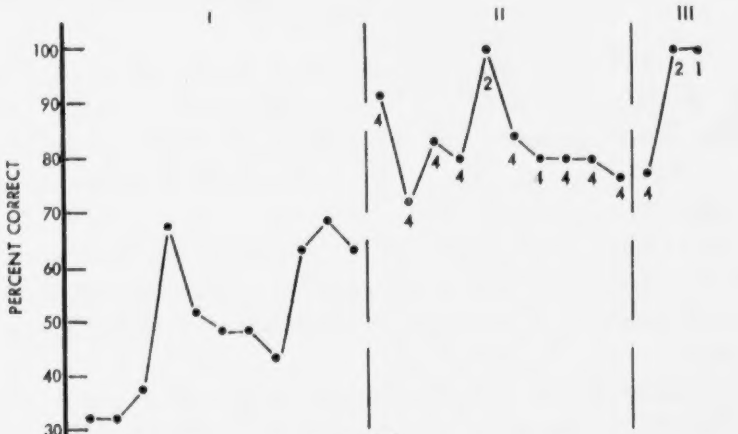

FIG. 3. S 15's percentage scores throughout the study.

During Phase 1 of this study 125 perfect scores were recorded, an average of 11·4 100 per cent papers per week. During Phase 2, however, 257 perfect papers were obtained, an average of 25·7 papers with 100 per cent scores from the 32-member class per week. Of these 257 perfect papers, 150 or 59 per cent were recorded on Tuesdays, the first day for a spelling test. On Wednesdays, the second day of testing, 69 or 27 per cent of the total 100 per cent scores were recorded. Meanwhile, 24 papers (9 per cent of the total) were recorded on Thursdays and 14 (5 per cent) on the final day.

During the final phase of the study, where, over a period of three weeks, 93 total tests were given, 85 perfect papers were submitted. Of these, 62 per cent were recorded on Tuesdays, 28 per cent on Wednesdays, 5 per cent on Thursdays, and 5 per cent on Fridays. Although a group contingency was in effect throughout Phase 3, the class never was allowed to listen to the radio, since the pupils did not all submit perfect papers on any one day. The nearest the class did come to being granted the radio contingency was on Tuesday of the final week, when 21 of the 29 who took the test received 100 per cent scores.

CONCLUSION

When teachers are requested to maintain evaluative data and plot graphically the academic performances of pupils, spelling may be the best place to begin. Two reasons might support such a statement. One, spelling performance is probably tested more systematically and regularly than other academic skills. The procedures for testing spelling from week to week are essentially the same—present the words orally and request the pupils to write them. Furthermore, spelling performance is generally assessed at least once each week, whereas evaluations in other academic areas are usually obtained less often. The second reason for using spelling as the basis for graphically and continuously obtaining records of academic performance is that most teachers already record pupil performance in spelling. Many teachers indicate in their record books, in a tabular manner, the weekly percentage scores of the pupils. It becomes a simple matter for the teacher to convert these tabular record book notations to percentage points on a graph.

The contingencies employed in this study represented a natural extension of the classroom environment. Free time activities, allowing children to undertake an activity of their choosing, are often regularly scheduled classroom events. Many times, however, these activities are provided on a non-contingent basis—not dependent upon prior behavior of the pupils. When contingent leisure time reading was employed during Phase 2 and when the group reinforcement, listening to the radio, was added during the final phase, these were sufficient to alter the majority of the pupils' spelling accuracy. The classroom teacher did not have to resort to reinforcers that were more expensive or less natural to the classrooms to alter effectively the performance of the children.

Of equal importance throughout this study was that not only did pupil performance increase when contingencies were applied, but the classroom teacher began to consider individually the children in his class. By viewing the pupil's performance in graphic rather than tabular form, the teacher noted how some children changed dramatically when the consequences were imposed, while others were minimally affected by them. Some children were consistently superior in spelling, while others performed in a less remarkable manner, regardless of the rewards offered. As to the latter children, the teacher speculated that while the initiated contingencies were effective with most pupils, perhaps to increase the performance of some children other individualized rules should be attempted. Further, when viewing the graphic records of certain children the teacher noted that a program revision was called for. The data suggested to the teacher that perhaps the program was too difficult for some of the pupils and too easy for others.

As a function of this investigation, two rather basic behavioral principles were pointed out to the classroom teacher—one, that the use of systematic contingencies can affect behavior, and two, that data may be used to facilitate the making of classroom decisions. Hopefully, then, this classroom teacher's successful experience in obtaining and using group data regarding spelling will generalize to other academic areas.

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Research Report
Department of Institutions
State of Washington

Volume 2
Number 2

A DEMONSTRATION PROJECT TO TRAIN PROGRAMMING AND CONTINGENCY MANAGEMENT ADVISORS

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Two years ago, a three year demonstration project, "The Application of Functional Analysis of Behavior by Teachers in a Natural School Setting," was funded by the United States Office of Education. This project, directed by Dr. Norris Haring, involves the cooperative efforts of four school districts in the Greater Seattle Area–Bellevue, Clover Park, Seattle, Lake Washington–and the Experimental Education Unit of the Child Development and Mental Retardation Center at the University of Washington.

The purpose of the project is to demonstrate how direct and continuous measurement techniques and contingency management procedures can be incorporated into public schools. Although much evidence is available that indicates the function of these procedures in clinical settings, limited support is noted as to the generalization of direct measurement and contingency management procedures to the public schools. In addition, the project was to train the project teachers to serve as teacher advisors, rather than as managers of children. It was believed that these persons would be of more service if they assisted twenty teachers in an elementary school who in turn managed 600 children, than were they assigned the instruction of 10 to 15 children in a special class.

During the spring of 1967, each of the four districts selected a teacher who had expressed an interest in the project, and was qualified for admittance to the University of Washington Graduate School. The four teachers were then engaged in a series of training exercises at the Experimental Education Unit (for two quarters of the 1968 academic year). At the beginning of the third quarter they returned to their schools to assist teachers to design and implement remediation procedures for children. During the summer, the four Project Advisors conducted classes designed to demonstrate principles of individualized instruction to teachers and principals at a workshop held in Clover Park. For the current year, they have been involved full time in their respective schools and are assisted by the project coordinator, Dr. Thomas Lovitt and the assistant coordinator, Barbara Meyer, from the Experimental Education Unit.

The following is a brief outline of the programs in the four schools and a representative project from each school.

Bellevue School District

Two programs, one involving teacher-training, and the other a demonstration class, have been instituted this year at Sherwood Forest Elementary School, where Betty Casperson is the Project Advisor and Lloyd Magruder the Principal. The teacher-training program consists of five exercises, with each teacher being required to complete one exercise before beginning the next. First, a teacher observes, then modifies a single social behavior of an individual child. Second, the teachers observe and then modify an academic behavior of an individual child by altering an antecedent condition. Third, they observe and modify an academic behavior of an individual child by altering a subsequent condition. Fourth, they observe and modify a single academic behavior for an entire class. Fifth, the teachers instruct the pupils in their classes to record their own behavior in one academic area.

The second program is a demonstration classroom conducted by the Project Advisor. This class, composed of nine second graders, is designed to demonstrate observation and recording techniques and the involvement of contingency management procedures to the Sherwood Forest Teachers.

A sample project conducted by a Sherwood Forest teacher involved a first-grade boy who had difficulty writing the symbols for "greater than" and "lesser than" between the numerals 0 through 9. Throughout the five day baseline period the pupil's median correct rate was .7 and his median error rate was .9 (Figure 1). The first change involved using only the numerals 0 through 5. During this condition, the boy's median correct rate was 1.6 and his median error rate was 0. The second change involved a return to the original condition where the numerals 0 through 9 were again involved. During this phase the pupil's median correct rate remained at 1.6 and his median error rate continued to be 0.

Clover Park School District

Hal Caufield, Project Advisor for Park Lodge Elementary School (George Sutich, Principal), supervises two programs. The first involves a demonstration classroom where math, spelling, and reading groups meet each day. The demonstration area is used as a Precision Teaching Center, where the Project Advisor conducts training exercises for the teachers from his building and other elementary schools in the district.

The second program is that of assisting several classroom teachers to obtain daily performance measures. To date, half of the total school enrollment is involved in the program.

Figure 2 is an example of a project conducted by a Park Lodge teacher who was concerned with three second graders who had difficulty in sequencing the letters of the alphabet. For a five day baseline period, each student sequenced a set of cards and correct and error rate calculations were obtained. On the sixth day a goal line was established with each child. Now, if the goal of no errors committed and the task completed within three minutes is achieved, the child earns 10 minutes of free time. An example of the results from one individual shows a baseline correct rate of 2.0 and a median correct rate of 9.8 during the first change. Meanwhile, his median error rate was .27 during the baseline and 0 during the first change period.

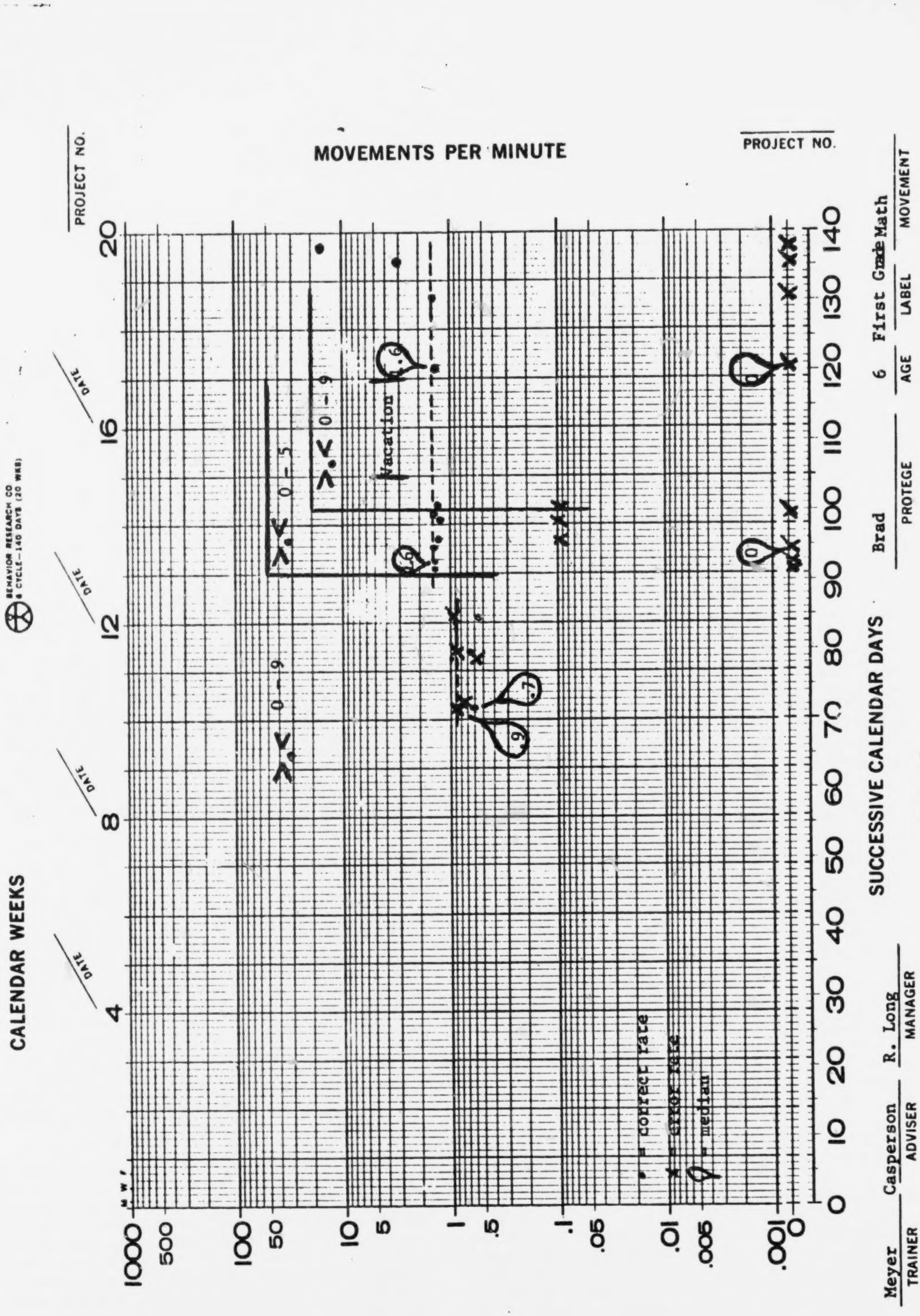
CALENDAR WEEKS
DATE
DATE
DATE
DATE
0
4
8
12
16
20
PROJECT NO.
MOVEMENTS PER MINUTE
PROJECT NO.
BEHAVIOR RESEARCH CO
6 CYCLE—140 DAYS (20 WKS)
1000
500
100
50
10
5
1
.5
.1
.05
.01
.005
.001
0
0 – 9
0 – 5
0 – 9
Vacation
• = correct rate
x = error rate
= median
.9
.7
.6
.6
0
0
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
SUCCESSIVE CALENDAR DAYS
Meyer
TRAINER
Casperson
ADVISER
R. Long
MANAGER
Brad
PROTEGE
6
AGE
First Grade Math
LABEL
MOVEMENT

FIGURE 1

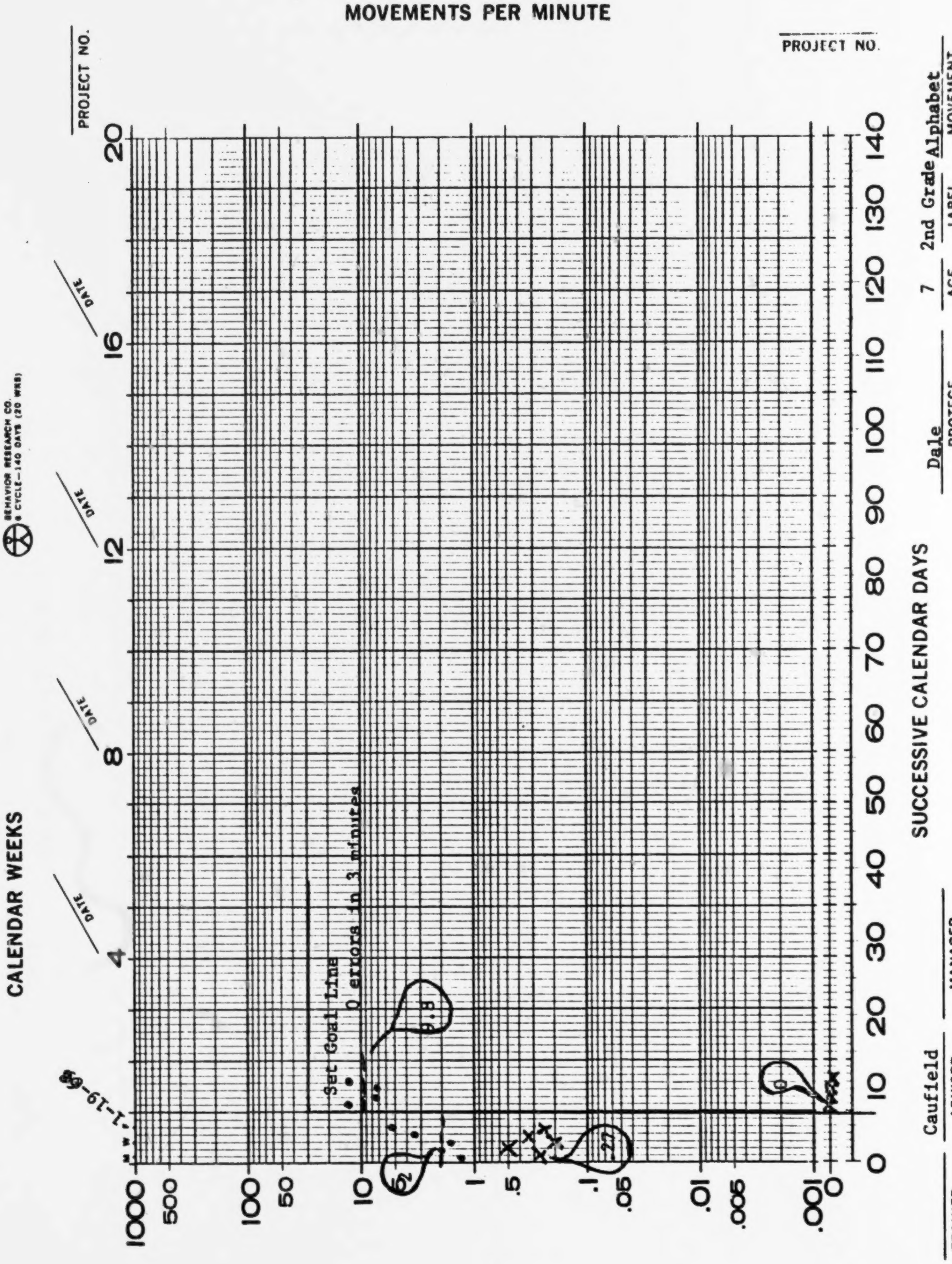
MOVEMENTS PER MINUTE
CALENDAR WEEKS
SUCCESSIVE CALENDAR DAYS
PROJECT NO.
PROJECT NO.
DATE
DATE
DATE
DATE
BEHAVIOR RESEARCH CO.
6 CYCLE–140 DAYS (20 WKS)
0
4
8
12
16
20
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
1000
500
100
50
10
5
1
.5
.1
.05
.01
.005
.001
0
Set Goal Line
0 errors in 3 minutes
9.8
6.2
.27
0
1-19-68
TRAINER
Caufield
ADVISER
MANAGER
Dale
PROTEGE
7
AGE
2nd Grade
LABEL
Alphabet
MOVEMENT

FIGURE 2

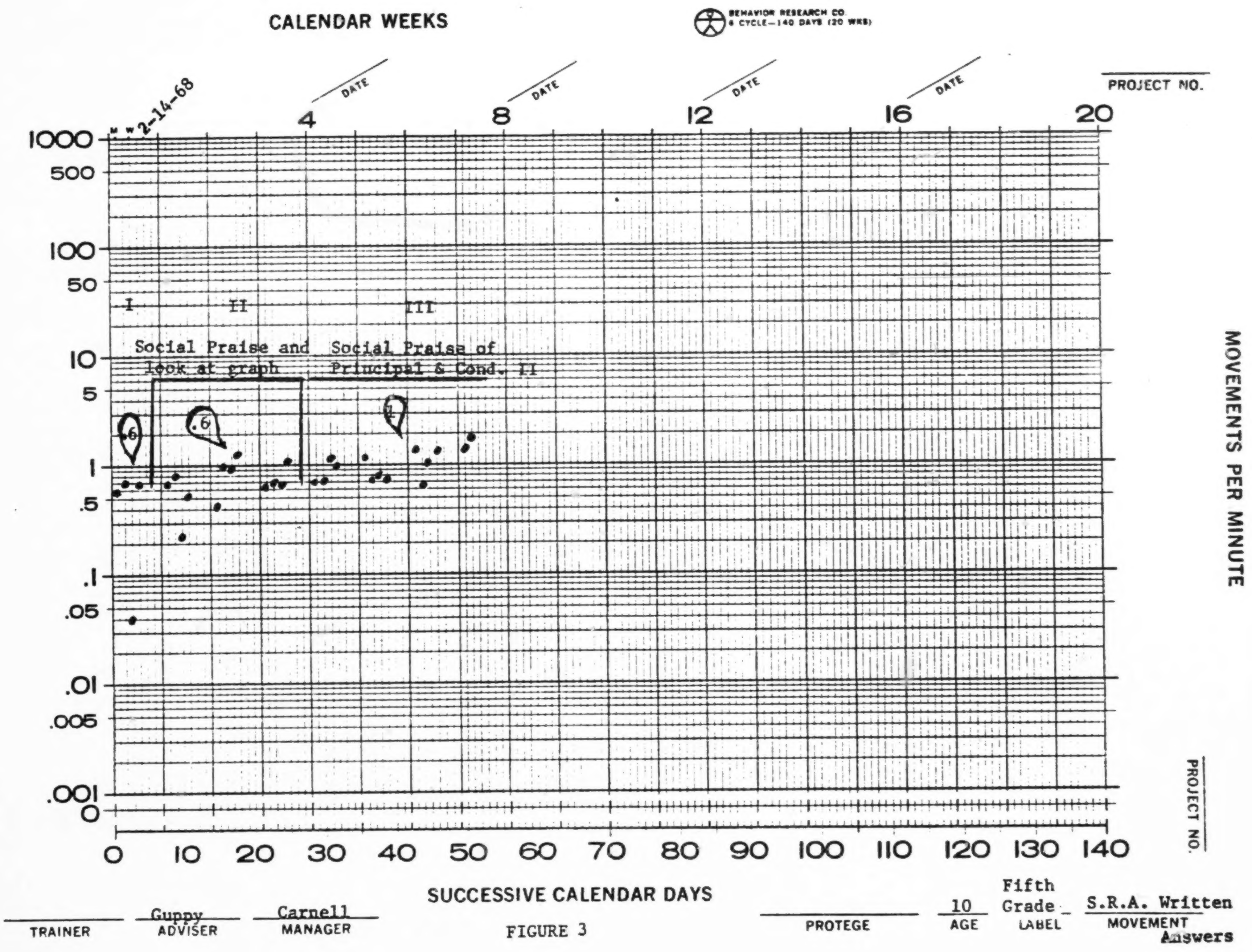
CALENDAR WEEKS
BEHAVIOR RESEARCH CO.
6 CYCLE—140 DAYS (20 WKS)
M W 2-14-68
DATE
DATE
DATE
DATE
PROJECT NO.
0
4
8
12
16
20
1000
500
100
50
10
5
1
.5
.1
.05
.01
.005
.001
0
I
II
III
Social Praise and look at graph
Social Praise of Principal & Cond. II
.6
.6
1
MOVEMENTS PER MINUTE
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
SUCCESSIVE CALENDAR DAYS
PROJECT NO.
TRAINER
Guppy
ADVISER
Carnell
MANAGER
PROTEGE
10
AGE
Fifth Grade
LABEL
S.R.A. Written Answers
MOVEMENT

FIGURE 3

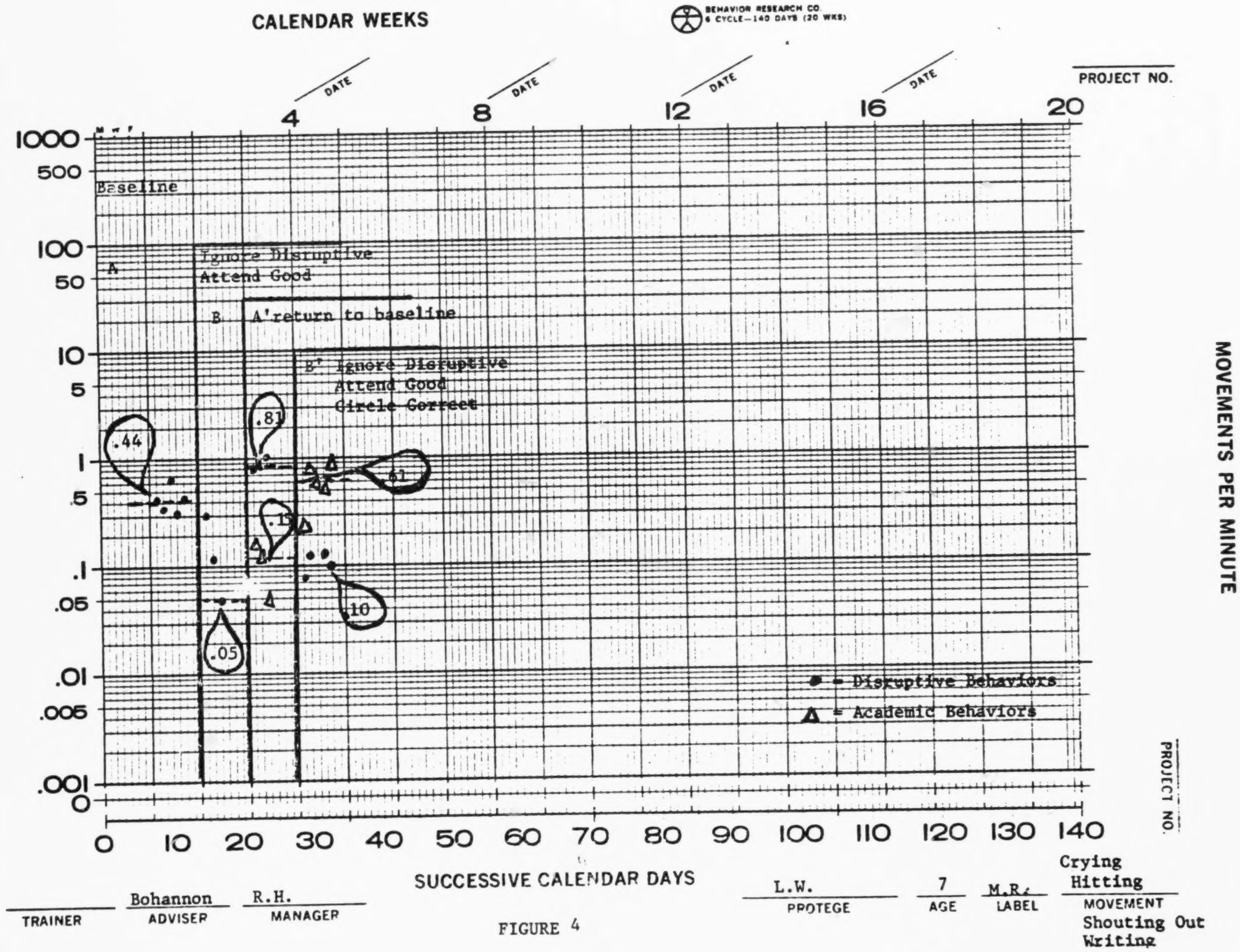
CALENDAR WEEKS
BEHAVIOR RESEARCH CO.
6 CYCLE—140 DAYS (20 WKS)
DATE
DATE
DATE
DATE
PROJECT NO.
4
8
12
16
20
1000
500
100
50
10
5
1
.5
.1
.05
.01
.005
.001
0
Baseline
A
Ignore Disruptive
Attend Good
B
A' return to baseline
B' Ignore Disruptive
Attend Good
Circle Correct
.44
.81
.15
.61
.10
.05
● = Disruptive Behaviors
Δ = Academic Behaviors
MOVEMENTS PER MINUTE
PROJECT NO.
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
SUCCESSIVE CALENDAR DAYS
TRAINER
Bohannon
ADVISER
R.H.
MANAGER
L.W.
PROTEGE
7
AGE
M.R.
LABEL
Crying
Hitting
MOVEMENT
Shouting Out
Writing

FIGURE 4

Seattle School District

The third school, Graham Hill Elementary (Frank Ross, Principal), also has two programs, a teacher-training program and a demonstration classroom, under the supervision of Tal Guppy, Project Advisor. The steps involved in the teacher-training program, and the purpose and design of the demonstration classroom are much the same as those previously described in the Bellevue program.

One project at Graham Hill concerned a fifth-grade teacher and 20 students assigned the SRA power building materials. It was the goal of this teacher to increase a child's reading achievment by accelerating and then maintaining a high correct rate of responding. During the baseline condition the children did not know their performance was being recorded. Throughout the first change phase of the study individual conferences were arranged for each child. The children were shown their previous day's performance and commended if their rate had improved. During the second change, the individual conferences were continued along with a weekly visit from the Principal who praised those pupils whose performance had improved from the previous week. Figure 3 illustrates the performance of a pupil where rate was affected by the second change, but not the first.

Lake Washington School District

The fourth school, Audubon Elementary School (Don Hultgren, Principal), has instituted a voluntary program under the supervision of the Project Advisor, Ralph Bohannon. Teachers at Audubon contact the Advisor as problems in management or programing arise. Bohannon also supervises a training program for all of the special education teachers in the district.

One project carried out at Audubon involved a seven-year-old girl who displayed a high rate of disruptive behaviors, such as hitting, crying, and shouting (Figure 4). The first change following a period of baseline assessment, involved the teacher's ignoring all disruptive behaviors and attending to legible penmanship. The second change involved a return to the initial condition–attending to disruptive behavior and not attending to correct writing. During the third change the teacher again attended to correct writing, and in addition, she circled each correctly written letter. The results indicated that disruptive behavior decreased during periods when they were not attended. It was additionally observed, that throughout the study as disruptive behavior decelerated, academic performance rate accelerated.

Currently, 61 teachers are being assisted by the four Project Advisors, while daily performance measures are obtained from 962 pupils. Thus, both purposes of the demonstration project have, to some extent, been realized; (1) that the procedures of direct measurement and contingency management can be implemented by classroom teachers and (2) that Advisors can assist a number of teachers who in turn manage several pupils.